LEARNING OBJECTIVES

- Describe the pathophysiology of preeclampsia and eclampsia.
- Differentiate the management of the woman with mild preeclampsia from that of the woman with severe preeclampsia.
- Identify the priorities for management of eclamptic seizures.
- Describe HELLP syndrome, including appropriate nursing actions.
- Explain the effects of hyperemesis gravidarum on maternal and fetal well-being.
- Discuss the management of the woman with hyperemesis gravidarum in the hospital and at home.
- Differentiate among causes, signs and symptoms, possible complications, and management of miscarriage, ectopic pregnancy, incompetent cervix, and hydatidiform mole.
- Compare and contrast placenta previa and abruptio placentae in relation to signs and symptoms, complications, and management.
- Discuss the diagnosis and management of disseminated intravascular coagulation.
- Differentiate signs and symptoms, effects on pregnancy and the fetus, and management during pregnancy of common sexually transmitted infections and other infections.
- Explain the basic principles of care for a pregnant woman undergoing abdominal surgery.
- Discuss implications of trauma on the mother and fetus during pregnancy.
- Identify priorities in assessment and stabilization measures for the pregnant trauma victim.

KEY TERMS AND DEFINITIONS

abruptio placenta Partial or complete premature separation of a normally implanted placenta cervix. Use of nonabsorbable suture to keep a premature dilating cervix closed; usually removed when pregnancy is at term.
cervical funneling Effacement of the internal cervical os.
chronic hypertension Systolic pressure of 140 mm Hg or higher or diastolic pressure of 90 mm Hg or higher that is present preconceptionally or occurs before 20 weeks of gestation.
couvelaire uterus Interstitial myometrial hemorrhage after premature separation (abruption) of placenta; purplish-blush discoloration of the uterus and boardlike rigidity of the uterus are noted.
disseminated intravascular coagulation (DIC) Pathologic form of coagulation in which clotting factors are consumed to such an extent that generalized bleeding can occur; associated with abruptio placenta, eclampsia, intrauterine fetal demise, amniotic fluid embolism, and hemorrhage.
eclampsia Severe complication of pregnancy of unknown cause and occurring more often in the primigravida; characterized by new onset grand mal seizures in a woman with preeclampsia occurring during pregnancy or shortly after birth.
eclamptic pregnancy. Implication of the fertilized ovum outside of the uterine cavity; locations include the uterine tubes, ovaries, and abdomen.
gestational hypertension The new onset of hypertension without proteinuria after week 20 of pregnancy.
HELLP syndrome Condition characterized by hemolysis, elevated liver enzymes, and low platelet count; a complication of severe preeclampsia.
hydadiform mole (molar pregnancy) Gestational trophoblastic neoplasm usually resulting from fertilization of an egg that has no nucleus or an inactivated nucleus.
hyperemesis gravidarum Abnormal condition of pregnancy characterized by protracted vomiting, weight loss, and fluid and electrolyte imbalance.
miscarriage Loss of pregnancy that occurs naturally without interference or known cause; also called spontaneous abortion.
HYPERTENSION IN PREGNANCY

Significance and Incidence

Hypertension is the most common medical complication of pregnancy (Martin et al., 2005). A significant contributor to maternal and perinatal morbidity and mortality, preeclampsia complicates approximately 9% to 22% of all pregnancies not ending in first-trimester miscarriages (American College of Obstetricians and Gynecologists [ACOG], 2002; Martin et al., 2005). The rate has risen steadily by about 30% to 40%, since 1990, though it has been essentially unchanged since 2000 for all age, racial, and ethnic groups. The current rate is 174 per 1000 live births (Martin et al., 2005). In addition, rates for chronic hypertension have increased moderately (8.4 per 1000), whereas the rate for eclampsia has declined to 4.0 per 1000 live births (Martin et al., 2005). Age distribution remains U-shaped, with women younger than 20 years of age and older than 40 years of age having the highest rates of occurrence of hypertension. Maternal race also influences the rate of pregnancy-associated hypertension, with the highest rates seen in Native American (69.7 per 1000) and African American (40.2 per 1000) women. Hispanic women have an intermediate rate (25.9 per 1000), and Asian or Pacific Islander women have the lowest rate for hypertension complicating pregnancy (19.6 per 1000) (Martin et al., 2005).

Eclampsia complicates approximately 9% to 22% of all pregnancies not ending in first-trimester miscarriages (American College of Obstetricians and Gynecologists [ACOG], 2002; Martin et al., 2005). The rate has risen steadily by about 30% to 40%, since 1990, though it has been essentially unchanged since 2000 for all age, racial, and ethnic groups. The current rate is 174 per 1000 live births (Martin et al., 2005). In addition, rates for chronic hypertension have increased moderately (8.4 per 1000), whereas the rate for eclampsia has declined to 4.0 per 1000 live births (Martin et al., 2005). Age distribution remains U-shaped, with women younger than 20 years of age and older than 40 years of age having the highest rates of occurrence of hypertension. Maternal race also influences the rate of pregnancy-associated hypertension, with the highest rates seen in Native American (69.7 per 1000) and African American (40.2 per 1000) women. Hispanic women have an intermediate rate (25.9 per 1000), and Asian or Pacific Islander women have the lowest rate for hypertension complicating pregnancy (19.6 per 1000) (Martin et al., 2005). In the United States, preeclampsia ranks second only to embolic events as a cause of maternal mortality and accounts for almost 15% of these deaths (National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy [Working Group], 2000). Hypertension (chronic and gestational) complicating pregnancy increases the woman’s risk for a cesarean birth.

Preeclampsia predisposes the woman to potentially lethal complications, including eclampsia, abruptio placentae, disseminated intravascular coagulation (DIC), acute renal failure, hepatic failure, adult respiratory distress syndrome, and cerebral hemorrhage (Working Group, 2000). Preeclampsia occurs primarily after the second trimester of pregnancy and contributes significantly to intrapartum fetal death and perinatal mortality (Working Group, 2000). Causes of perinatal death related to preeclampsia are uteroplacental insufficiency and abruptio placentae, which lead to intrapartum death, preterm birth, and low birth weight (Roberts, 2004).

Eclampsia (characterized by seizures) from significant cerebral effects of preeclampsia is the major maternal hazard. As a rule, maternal and perinatal morbidity and mor-
tality rates are highest among cases in which eclampsia is seen early in gestation (before 28 weeks), maternal age is greater than 25 years, the woman is a multigravida, and chronic hypertension or renal disease is present (Mattar & Sibai, 2000). The fetus of the eclamptic woman is at increased risk for hypertension pregnancy, preterm birth, intrauterine growth restriction (IUGR), and acute hypoxia (Gilbert & Harmon, 2003).

Classification

The hypertensive disorders of pregnancy encompass a variety of conditions featuring an elevation of maternal blood pressure (BP) with a corresponding risk to maternal and fetal well-being. Hypertension is the third leading cause of maternal mortality, accounting for 16% of pregnancy-related deaths (Chang et al., 2003). The classification system most commonly used in the United States today is based on reports from ACOG (2002) and the National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy (2000). This classification system is summarized in Table 23-1.

**Gestational hypertension**

Gestational hypertension is the onset of hypertension without proteinuria after week 20 of pregnancy (ACOG, 2002; Working Group, 2000). Chronic hypertension and gestational hypertension may occur independently or simultaneously. The diagnosis and differentiation between gestational hypertension and preeclampsia is made in the postpartum period. If the woman has not developed preeclampsia and her BP returns to normal values by 12 weeks after birth, the woman is diagnosed with transient hypertension. If BP values remain elevated, then the diagnosis of chronic hypertension is made (ACOG, 2002; Working Group, 2000).

**Preeclampsia**

Preeclampsia is a pregnancy-specific condition in which hypertension develops after 20 weeks of gestation in a previously normotensive woman. It is a multisystem, vasospastic disease process characterized by hypertension and proteinuria (ACOG, 2002; Working Group, 2000). Preeclampsia is usually categorized as mild or severe for purposes of management (Table 23-2).

Hypertension is defined as a systolic BP greater than 140 mm Hg or a diastolic BP greater than 90 mm Hg (ACOG, 2002; Working Group, 2000). The diagnosis of a new onset of hypertension during pregnancy is based on at least two measurements at least 4 to 6 hours apart. The Working Group (2000) recommend that the blood pressure, disappearance of sound (Korotkoff phase V) be taken with the woman upright or if hospitalized either upright or in the left lateral recumbent position with the arm at heart level. They further recommend no tobacco or caffeine use within the preceding 30 minutes of blood pressure measurement.
More accurate readings are obtained with use of an appropriate size cuff (1.5 times longer than the upper arm circumference) and with a mercury sphygmomanometer (ACOG, 2002). Women who demonstrate an increase of 30 mm Hg systolic or 15 mm Hg diastolic should be closely monitored if the BP elevation occurs with proteinuria and hyperuricemia (uric acid of 6 mg/dl or more) (ACOG, 2002; Working Group, 2000). See Box 23-1 for instructions for measuring BP.

Proteinuria is defined as a concentration of 30 mg/dl in a random urine or more in at least two random urine specimens collected at least 6 hours apart. In a 24-hour specimen, proteinuria is defined as a concentration of ±300 mg/24 hours. Due to the discrepancies between a random urine and a 24-hour urine protein, the 24-hour urine is preferred for diagnosis (Working Group, 2000). Pathologic edema is a clinically evident, generalized accumulation of fluid of the face, hands, or abdomen that is not responsive to 12 hours of bed rest. It may also be manifested as a rapid weight gain of more than 2 kg in 1 week. Edema frequently occurs in pregnancy and is no longer considered diagnostic of preeclampsia (ACOG, 2002; Working Group, 2000).

Severe preeclampsia

Severe preeclampsia is the presence of any one of the following in the woman diagnosed with preeclampsia: (1) systolic BP of at least 160 mm Hg or diastolic BP of at least 110 mm Hg; (2) proteinuria of greater than 2 g protein excreted in a 24-hour specimen, or greater than 2+ on dipstick; (3) oliguria, of less than 500 ml over 24 hours; (4) cerebral or visual disturbances, such as altered level of consciousness (LOC), headache, scotomata, or blurred vision; (5) hepatic involvement, including epigastric pain; (6) thrombocytopenia with a platelet count less than 100,000/mm³; (7) pulmonary edema.

### TABLE 23-2
Differentiation between Mild and Severe Preeclampsia

<table>
<thead>
<tr>
<th>MILD PREECLAMPSIA</th>
<th>SEVERE PREECLAMPSIA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MATERIAL EFFECTS</strong></td>
<td></td>
</tr>
<tr>
<td>Blood pressure (BP)</td>
<td>BP reading &gt;140/90 mm Hg x 2, 4-6 hr apart</td>
</tr>
<tr>
<td>Mean arterial pressure (MAP)</td>
<td>&gt;105 mm Hg</td>
</tr>
<tr>
<td>Proteinuria</td>
<td>Proteinuria of ±300 mg in a 24-hr specimen; ±1+ on dipstick</td>
</tr>
<tr>
<td>May be normal</td>
<td></td>
</tr>
<tr>
<td>Urine output</td>
<td>Output matching intake, ≥30 ml/hr or ≤600 ml/24 hr</td>
</tr>
<tr>
<td>Absent or transient</td>
<td>Persistent or Severe</td>
</tr>
<tr>
<td>Headache</td>
<td>Absent</td>
</tr>
<tr>
<td>Visual problems</td>
<td></td>
</tr>
<tr>
<td>Irritability or changes in affect</td>
<td>Transient</td>
</tr>
<tr>
<td>Epigastric pain</td>
<td>Absent</td>
</tr>
<tr>
<td>Serum creatinine</td>
<td>Normal</td>
</tr>
<tr>
<td>Thrombocytopenia</td>
<td>Absent</td>
</tr>
<tr>
<td>AST elevation</td>
<td>Normal or minimal</td>
</tr>
<tr>
<td>Pulmonary edema</td>
<td>Absent</td>
</tr>
<tr>
<td><strong>FETAL EFFECTS</strong></td>
<td></td>
</tr>
<tr>
<td>Placental perfusion</td>
<td>Reduced</td>
</tr>
<tr>
<td>Premature placental aging</td>
<td>Not apparent</td>
</tr>
<tr>
<td>Proteinuria</td>
<td>Proteinuria of 2.0 grams in 24 hr or ±2+ on dipstick</td>
</tr>
<tr>
<td>Hyperreflexia</td>
<td>Hyperreflexia ±3+, possible ankle clonus</td>
</tr>
<tr>
<td>Persistent or Severe</td>
<td>Persistent or Severe</td>
</tr>
<tr>
<td>Blurred, photophobia, blind spots on funduscopic</td>
<td></td>
</tr>
<tr>
<td>Transient</td>
<td>Severe</td>
</tr>
<tr>
<td>Headache</td>
<td>Elevated, ±2+</td>
</tr>
<tr>
<td>Serum creatinine</td>
<td>Present or &lt;100,000/mm³</td>
</tr>
<tr>
<td>AST elevation</td>
<td>Marked</td>
</tr>
<tr>
<td>Pulmonary edema</td>
<td>Present</td>
</tr>
<tr>
<td>Proteinuria of 300 mg in a 24-hr specimen; ±1+ on dipstick</td>
<td></td>
</tr>
<tr>
<td>Proteinuria</td>
<td></td>
</tr>
<tr>
<td>Mean arterial pressure (MAP)</td>
<td>Rise to ≥160/110 mm Hg on two separate occasions 4-6 hr apart</td>
</tr>
<tr>
<td>Blood pressure (BP)</td>
<td>≥105 mm Hg</td>
</tr>
</tbody>
</table>

Blood Pressure Measurement

- Measure blood pressure with the woman seated (ambulatory) or in the left lateral recumbent position with the arm at heart level.
- After positioning, allow the woman at least 10 minutes of quiet rest before blood pressure measurement, to encourage relaxation.
- No tobacco or caffeine use 30 minutes prior to blood pressure measurement.
- Use the proper-sized cuff (cuff should cover approximately 80% of the upper arm or be 1.5 times the length of the upper arm).
- Maintain a slow, steady deflation rate.
- Take the average of two readings at least 6 hours apart to minimize recorded blood pressure variations across time.
- Use Korotkoff phase V (disappearance of sound) for recording the diastolic value (some sources recommend recording both phase IV (the muted sound) and phase V).
- Use accurate equipment. The manual sphygmomanometer is the most accurate device.
- If interchanging manual and electronic devices, use caution in interpreting different blood pressure values.

Eclampsia

Eclampsia is the onset of seizure activity or coma in a patient with preeclampsia, with no history of preexisting pathology that can result in seizure activity (ACOG, 2002; Working Group, 2000). The initial presentation of eclampsia varies; one third of the women develop eclampsia during the pregnancy, one third during labor, and one third within 72 hours postpartum (Emery, 2005).

Chronic hypertension

Chronic hypertension is defined as hypertension present before the pregnancy or diagnosed before the twentieth week of gestation. Hypertension that persists longer than 6 weeks postpartum is also classified as chronic hypertension (Emery, 2005). There is no widely accepted definition of mild hypertension. Severe hypertension is usually defined as a diastolic BP of 110 mm Hg or higher (ACOG, 2002; Working Group, 2000).

Chronic hypertension with superimposed preeclampsia

Superimposed preeclampsia is the development of a new onset proteinuria (300 mg or greater in a 24-hour urine collection), sudden increase in proteinuria, sudden increase in hypertension or the presentation of HELLP syndrome (hemolysis, elevated liver enzymes, and low platelets) in a pregnant woman with hypertension before 20 weeks of gestation (ACOG, 2002; Sibai, 2002).

Etiology

The etiology of high blood pressure in pregnancy is not known. What is known is that with an increased maternal blood pressure, fluid moves from the vascular system to the extravascular spaces. Blood becomes hemoconcentrated with a decreased renal plasma flow and glomerular filtration rate. Pregnant women with chronic high blood pressure have a 20% reduction in sodium excretion. An elevated blood pressure in pregnancy and the subsequent vasoconstriction will reduce uteroplacental perfusion with alterations in fetal growth (Blackburn, 2003).

Preeclampsia is a condition unique to human pregnancy; signs and symptoms usually develop only during pregnancy and disappear quickly after birth of the fetus and passage of the placenta. The cause is unknown. No single patient profile identifies the woman who will have preeclampsia. However, certain high risk factors are associated with the development of preeclampsia: primigravidity, multifetal presentation, preexisting diabetes mellitus, and African-American ethnicity (Box 23-2) (ACOG, 2002; Duckitt & Harrington, 2005).

Current theories regarding the etiology of hypertension in pregnancy include, hyperhomocysteinemia (Mignini et al., 2005), antiphospholipid antibodies (Dildy, 2004), increased vascular tone, abnormal vascular response to placental, abnormal prostaglandin action, endothelial cell dysfunction (Dildy, 2004; Sibai, Dekker & Kupferminc, 2005), coagulation abnormalities, abnormal trophoblast invasion, and dietary factors (ACOG, 2002; Cunningham et al., 2005). Immunologic factors and genetic disposition may also play an important role in the etiology of hypertension in pregnancy (Roberts, 2004).

Pathophysiology

Preeclampsia is characterized by vasospasms, changes in the coagulation system, and disturbances in systems related to volume and BP control. Vasospasms result from an increased sensitivity to circulating pressors, such as angiotensin II, and possibly an imbalance between the prostaglandins prostacyclin and thromboxane A2 (ACOG, 2002; Working Group, 2000).

Endothelial cell dysfunction, believed to result from decreased placental perfusion, may account for many changes in preeclampsia (Fig. 23-1). Arteriolar vasospasm may cause endothelial damage and contribute to an increased capillary permeability. This increases edema and further decreases intravascular volume, predisposing the woman with preeclampsia to pulmonary edema (ACOG, 2002; Working Group, 2000).
Immunologic factors may play an important role in the development of preeclampsia (Roberts, 2004; Sibai, 2002). The presence of a foreign protein, the placenta, or the fetus may be perceived by the mother’s immune system as an antigen. This may then trigger an abnormal immunologic response. This theory is supported by the increased incidence of preeclampsia or eclampsia in first-time mothers (first exposure to fetal tissue) or to multiparous women pregnant by a new partner (Cunningham et al., 2005; Li & Wi, 2000). Preeclampsia may be an immune complex disease in which the maternal antibody system is overwhelmed from excessive fetal antigens in the maternal circulation. This theory seems compatible with the high incidence of preeclampsia among women exposed to a large mass of trophoblastic tissue as seen in twin pregnancies or hydatidiform moles.

Genetic predisposition may be another immunologic factor. Dekker (2001) reported a greater frequency of preeclampsia and eclampsia among daughters and granddaughters of women with a history of eclampsia, which suggests an autosomal recessive gene controlling the maternal immune response. Paternal factors are also being examined (Cunningham et al., 2005; Robillard, 2002).

Diets inadequate in nutrients, especially protein, calcium, sodium, magnesium, and vitamins E and C, may be an etiologic factor in preeclampsia. Some practitioners prescribe high-protein diets (90 mg supplemental protein) without caloric restriction and moderate sodium intake in the prevention and treatment of this disorder. However, data are limited regarding the association between diet and preeclampsia.

Preeclampsia progresses along a continuum from mild disease to severe preeclampsia, HELLP syndrome, or eclampsia. The pathophysiology of preeclampsia reflects alterations in the normal adaptations of pregnancy. Normal physiologic adaptations to pregnancy include increased blood plasma volume, vasodilation, decreased systemic vascular resistance, elevated cardiac output, and decreased colloid osmotic pressure (Box 23-3). Pathologic changes in the endothelial cells of the glomeruli (glomeruloendotheliosis) are uniquely characteristic of preeclampsia, particularly in nulliparous women. The main pathogenic factor is not an increase in BP but poor perfusion as a result of vasospasm. Arteriolar vasospasm diminishes the diameter of blood vessels, which impedes blood flow to all organs and raises BP (Working Group, 2000).

Function in organs such as the placenta, kidneys, liver, and brain is decreased by as much as 40% to 60%. The pathophysiologic sequelae are shown in Fig. 23-1.
HELLP syndrome

HELLP syndrome is a laboratory diagnosis for a variant of severe preeclampsia that involves hepatic dysfunction, characterized by hemolysis (H), elevated liver enzymes (EL), and low platelets (LP) (ACOG, 2002; Sibai, 2004). The platelet count must be less than 100,000/mm³, liver enzyme levels (as characterized by hemolysis (H), elevated liver enzymes (EL), and decreased clotting factors, predisposing to disseminated intravascular coagulation and clotting), serum albumin resulting in decreases in colloid osmotic pressure, predisposing toward pulmonary edema, renal plasma flow, and glomerular filtration rate, and vitamin K. The unique form of coagulopathy (not DIC) occurs with HELLP syndrome. The platelet count is low, but coagulation factor assays, prothrombin time (PT), partial thromboplastin time (PTT), and bleeding time are normal. In some instances, hemolysis does not occur or presence of preeclampsia.

A diagnosis of HELLP syndrome is associated with an increased risk of maternal death. Perinatal mortality rates range from 7.4% to 20.4% with a maternal mortality of approximately 1% (Sibai, 2004). Preterm labor is greatly increased, 70% with subsequent fetal and neonatal complications associated with preterm delivery such as respiratory distress syndrome and intracerebral hemorrhage (Sibai, 2004). HELLP syndrome is often nonspecific in clinical presentation. A majority of patients report a history of malaise for several days. Many women (30% to 90%) experience epigastric or right upper quadrant abdominal pain (possibly related to hepatic ischemia), nausea, and vomiting (Sibai, 2004).

NURSE ALERT It is extremely important to understand that many patients with HELLP syndrome may not have signs or symptoms of severe preeclampsia. For example, many of these women are normotensive or have only slight elevations in BP. Proteinuria may also be absent. As a result, women with HELLP syndrome are often misdiagnosed with a variety of other medical or surgical disorders (Sibai, 2004).

Recognition of the clinical and laboratory findings associated with HELLP syndrome is important if early, aggressive therapy is to be initiated to prevent maternal and neonatal morbidity. Complications reported with HELLP syndrome include renal failure, pulmonary edema, ruptured liver hematoma, DIC, and placental abruption (Sibai, 2004).

CARE MANAGEMENT

Assessment and Nursing Diagnoses

Hypertensive disorders of pregnancy can occur without warning or with the gradual development of symptoms. A key goal is early detection of the disease in order to prevent the catastrophic maternal and fetal sequelae. Therefore each woman is assessed for etiologic factors during the first prenatal visit (see Box 23-2). During each subsequent visit the woman is assessed for signs or symptoms that suggest the onset or presence of preeclampsia.

Interview

The nurse reviews the woman’s admission form and prenatal record. The nurse conducts the interview to clarify, expand, or complete the form. The medical history is reviewed, especially the presence of diabetes mellitus, renal disease, and hypertension. Family history is explored for occurrence of preeclamptic or hypertensive conditions, diabetes mellitus, and other chronic conditions. The social and experiential history provides information about the woman’s support system, nutritional status, cultural beliefs, activity level, and lifestyle behaviors (e.g., smoking, alcohol and drug use).

A review of systems adds to the database for detecting BP changes from baseline and the presence of proteinuria.
It is important to note whether the woman is having unusual, frequent, or severe headaches; visual disturbances; or epigastric pain. Abnormal amount and pattern of weight gain and increased signs of edema may be present even though they may not be specifically diagnostic signs of preeclampsia.

**Physical examination**

Personnel caring for pregnant women need to be consistent in taking and recording BP measurements in the standardized manner (see Box 23-1). Electronic BP devices are less accurate in high flow states such as pregnancy or in hypertensive or hypotensive states.

Observation of edema in addition to hypertension warrants additional investigation. Edema is assessed for distribution, degree, and pitting. If periorbital or facial edema is not obvious, the pregnant woman is asked whether it was present when she awoke. Edema may be described as dependent or pitting.

Dependent edema is edema of the lowest or most dependent parts of the body, where hydrostatic pressure is greatest. If a pregnant woman is ambulatory, this edema may first be evident in the feet and ankles. If the pregnant woman is confined to bed, the edema is more likely to occur in the sacral region.

Pitting edema is edema that leaves a small depression or pit after finger pressure is applied to the swollen area. The pit, which is caused by movement of fluid to adjacent tissue away from the point of pressure, normally disappears within 10 to 30 seconds. Although the amount of edema is difficult to quantify, the method shown in Fig. 23-3 may be used to record relative degrees of edema formation.

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Fig. 23-2 Pathophysiology of preeclampsia. (Modified from Gilbert, E., & Harmon, J. [2003]. Manual of high risk pregnancy and delivery [3rd ed.]. St. Louis: Mosby.)

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<table>
<thead>
<tr>
<th>Decreased placental perfusion</th>
<th>Increased thromboxanes to prostacyclines / increased sensitivity to angiotensin II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placental production of endothelin (a substance toxic to endothelial cells)</td>
<td>Decreased nitric oxide</td>
</tr>
<tr>
<td>Vasoconstriction</td>
<td>Fluid shifts from intravascular to extravascular space (Decreased plasma volume) (Increased hematocrit)</td>
</tr>
<tr>
<td>Endothelial injury</td>
<td>Increased endothelin-1</td>
</tr>
<tr>
<td>Increased uteroplacental arteriole lesions</td>
<td>Intravascular coagulation</td>
</tr>
<tr>
<td>Generalized vasoconstriction</td>
<td>Hypertension</td>
</tr>
<tr>
<td>Uteroplacental arterial lesions</td>
<td>Proteinuria</td>
</tr>
<tr>
<td>Glomerular damage</td>
<td>Increased plasma uric acid and creatinine</td>
</tr>
<tr>
<td>Generalized edema</td>
<td>Increased sodium retention</td>
</tr>
<tr>
<td>Cortical brain spasms</td>
<td>Visual edema of face, hands, and abdomen</td>
</tr>
<tr>
<td>Pulmonary edema</td>
<td>Pitting edema after 12 hours of bed rest</td>
</tr>
<tr>
<td>Retinal arteriolar spasms</td>
<td>Headaches</td>
</tr>
<tr>
<td>Hypertension</td>
<td>Preeclampsia</td>
</tr>
<tr>
<td>Decreased hemoglobin</td>
<td>Seizure activity</td>
</tr>
<tr>
<td>Maternal hyperbilirubinemia</td>
<td>Elevated liver enzymes (AST and LDH)</td>
</tr>
<tr>
<td>Elevated liver enzymes (AST and LDH)</td>
<td>Mesenteric edema</td>
</tr>
<tr>
<td>Hepatic microemboli, liver damage</td>
<td>Right upper quadrant pain</td>
</tr>
<tr>
<td>Liver rupture</td>
<td>Decreased blood glucose</td>
</tr>
<tr>
<td>Liver damage</td>
<td>Nausea/vomiting</td>
</tr>
<tr>
<td>Decreased platelet aggregation and fibrin deposition</td>
<td>Hemolysis of red blood cells (Torn RBCs)</td>
</tr>
<tr>
<td>Platelet aggregation and fibrin deposition</td>
<td>Increased plasma uric acid and creatinine</td>
</tr>
<tr>
<td>Increased sodium retention</td>
<td>Oliguria</td>
</tr>
<tr>
<td>Increased uterine contractility</td>
<td>Increased plasma uric acid and creatinine</td>
</tr>
<tr>
<td>Proteinuria</td>
<td>Increased sodium retention</td>
</tr>
<tr>
<td>Seizure activity</td>
<td>Elevated liver enzymes (AST and LDH)</td>
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<td>Proteinuria</td>
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Symptoms reflecting central nervous system (CNS) and visual system involvement usually accompany facial edema. Although it is not a routine assessment during the prenatal period, evaluation of the fundus of the eye yields valuable data. An initial baseline finding of normal eye grounds assists in differentiating preexisting disease from a new disease process. The woman will also be assessed for epigastric pain and oliguria. Respiration is also assessed for crackles, which may indicate pulmonary edema.

Deep tendon reflexes (DTRs) are evaluated if preeclampsia is suspected. The biceps and patellar reflexes and ankle clonus are assessed, and the findings recorded.

**NURSE ALERT** The evaluation of DTRs is especially important if the woman is being treated with magnesium sulfate; absence of DTRs is an early indication of impending magnesium toxicity.

To elicit the biceps reflex, the examiner strikes a downward blow over the thumb, which is situated over the biceps tendon (Fig. 23-4, A). Normal response is flexion of the arm at the elbow, described as a 2+ response (Table 23-3). The patellar reflex is elicited with the woman’s legs hanging freely over the end of the examining table or with the woman lying on her left side with the knee slightly flexed. A blow with a percussion hammer is dealt directly to the patellar tendon, inferior to the patella. Normal response is extension or kicking out of the leg (Fig. 23-4, B). To assess for hyperactive reflexes (clonus) at the ankle joint, the examiner supports the leg with the knee flexed (Fig. 23-4, C). With one hand, the examiner sharply dorsiflexes the foot, maintains the position for a moment, and then releases the foot. Normal (negative clonus) response is elicited when no rhythmic oscillations (jerks) are felt while the foot is held in dorsiflexion. When the foot is released, no oscillations are seen as the foot drops to the plantar flexed position. Abnormal (positive clonus) response is recognized by rhythmic oscillations of one or more “beats” felt when the foot is in dorsiflexion and seen as the foot drops to the plantar flexed position.

An important assessment is determination of fetal status. Uteroplacental perfusion is decreased in women with preeclampsia, placing the fetus in jeopardy. Daily fetal movement counts are obtained. The fetal heart rate (FHR) is assessed for baseline rate and variability and accelerations, which indicate an intact, oxygenated fetal CNS. Abnormal baseline rate, decreased or absent variability, and late decelerations are indications of fetal intolerance to the intrauterine environment. Biophysical or biochemical monitoring such as nonstress tests (NSTs), contraction stress testing, biophysical profile (BPP), and serial ultrasonography are used to assess fetal status.

Doppler flow velocimetry studies are used for evaluating maternal and fetal well-being (see Chapter 21). Uteroplacental perfusion is assessed by measuring the velocity of blood flow through the uterine artery, umbilical arteries, or both. Abnormal uterine artery Doppler flow is associated with risk of IUGR in women with HELLP syndrome (Bush, O’Brien, & Barton, 2001). Currently, this diagnostic test is not recommended as a general screening test for preeclampsia (Sibai, 2002).

Uterine tonicity is evaluated for signs of labor and abruption placentae. If labor is suspected, a vaginal examination for...
cervical changes is indicated (see Table 23-8 for signs of abruptio placenta).

During the physical examination, the pregnant woman is examined for signs of progression of mild preeclampsia to severe preeclampsia or eclampsia. Signs of worsening liver involvement, renal failure, worsening hypertension, cerebral involvement, and developing coagulopathies must be assessed and documented. Respirations are assessed for crackles or diminished breath sounds, which may indicate pulmonary edema. Noninvasive assessment parameters include LOC, BP, hemoglobin oxygen saturation (pulse oximetry), electrocardiographic findings, and urine output. Eclampsia is usually preceded by various premonitory symptoms and signs, including headache, severe epigastric pain, hyperreflexia, and hemoconcentration. However, convulsions can appear suddenly and without warning in a seemingly stable woman with only minimum BP elevations (Sibai, 2004). Seizures may recur within minutes of the first convolution, or the woman may never have another. During the seizure, the mother and fetus are not receiving oxygen, so eclamptic seizures produce a metabolic insult to both the mother and fetus.

**Laboratory tests**

Blood and urine specimens are collected to aid in the diagnosis and treatment of preeclampsia, HELLP syndrome, and chronic hypertension. Baseline laboratory test information is useful in cases of early diagnosis of preeclampsia because it can be compared with later results to evaluate progression and severity of disease (Table 23-4). An

<table>
<thead>
<tr>
<th>Table 23-4: Common Laboratory Changes in Preeclampsia</th>
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<thead>
<tr>
<th></th>
<th>NORMAL</th>
<th>NONPREGNANT</th>
<th>PREECLAMPSIA</th>
<th>HELLP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemoglobin/hematocrit</td>
<td>12 to 16 g/dl</td>
<td>37% to 47%</td>
<td>↑↑ or ↓↑</td>
<td>↓↑</td>
</tr>
<tr>
<td>Platelets</td>
<td>150,000 to 400,000/mm³</td>
<td>Unchanged</td>
<td>Unchanged or &lt;100,000/mm³</td>
<td>&lt;100,000/mm³</td>
</tr>
<tr>
<td>Prothrombin time (PTT)</td>
<td>12 to 14 sec</td>
<td>60 to 70 sec</td>
<td>Unchanged</td>
<td>Unchanged</td>
</tr>
<tr>
<td>Prothrombin time (PTT)</td>
<td>Unchanged</td>
<td>Unchanged</td>
<td>Unchanged</td>
<td>Unchanged</td>
</tr>
<tr>
<td>Fibrinogen</td>
<td>200 to 400 mg/dl</td>
<td>Unchanged</td>
<td>Unchanged</td>
<td>Unchanged</td>
</tr>
<tr>
<td>Fibrin split products (FSP)</td>
<td>Absent</td>
<td>Absent</td>
<td>Unchanged</td>
<td>Unchanged</td>
</tr>
<tr>
<td>Blood urea nitrogen (BUN)</td>
<td>10 to 20 mg/dl</td>
<td>↑↑ or ↓↑</td>
<td>↑↑ or ↓↑</td>
<td>↑↑ or ↓↑</td>
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<tr>
<td>Creatinine</td>
<td>0.5 to 1.1 mg/dl</td>
<td>Unchanged</td>
<td>↑↑ or ↓↑</td>
<td>↑↑ or ↓↑</td>
</tr>
<tr>
<td>Lactate dehydrogenase (LDH)</td>
<td>45 to 90 units/L</td>
<td>Unchanged</td>
<td>Unchanged</td>
<td>Unchanged</td>
</tr>
<tr>
<td>Aspartate aminotransferase (AST)</td>
<td>4 to 20 units/L</td>
<td>Unchanged</td>
<td>Unchanged</td>
<td>Unchanged</td>
</tr>
<tr>
<td>Alanine aminotransferase (ALT)</td>
<td>3 to 21 units/L</td>
<td>Unchanged</td>
<td>Unchanged</td>
<td>Unchanged</td>
</tr>
<tr>
<td>Creatinine clearance</td>
<td>80 to 125 ml/min</td>
<td>Unchanged</td>
<td>Unchanged</td>
<td>Unchanged</td>
</tr>
<tr>
<td>Burr cells or schistocytes</td>
<td>Absent</td>
<td>Absent</td>
<td>Unchanged</td>
<td>Unchanged</td>
</tr>
<tr>
<td>Uric acid</td>
<td>2 to 6.6 mg/dl</td>
<td>Unchanged</td>
<td>↑↑ or ↓↑</td>
<td>↑↑ or ↓↑</td>
</tr>
<tr>
<td>Bilirubin (total)</td>
<td>0.1 to 1 mg/dl</td>
<td>Unchanged</td>
<td>Unchanged or ↑↑</td>
<td>↑↑ or ↓↑</td>
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</table>


*LDH values differ according to the test/assays being done.*
initial blood specimen is obtained for the following tests to assess the disease process and its effect on renal and hepatic functioning:

- Complete blood cell count (including a platelet count)
- Clotting studies (including bleeding time, PT, PTT, and fibrinogen)
- Liver enzymes (lactate dehydrogenase [LDH], AST, ALT)
- Chemistry panel (blood urea nitrogen [BUN], creatinine, glucose, uric acid)
- Type and screen, possible crossmatch and antibody screen

The hematocrit, hemoglobin, and platelet levels are monitored closely for changes indicating a worsening of patient status. Because hepatic involvement is a possible complication, serum glucose levels are monitored if liver function tests indicate elevated liver enzymes. Once the platelet count drops below 100,000/mm³, coagulation studies are needed to identify developing DIC (Sibai, 2002).

Urine output is assessed for volume of at least 30 ml/hr or 120 ml/4 hr. Proteinuria is determined from dipstick testing of a clean-catch or catheterized urine specimen. A reading of 2+ or 3+ on two or more occasions, at least 6 hours apart, should be followed by a 24-hour urine collection. A 24-hour collection to test for protein and creatinine clearance is more reflective of true renal status. Renal laboratory assessments include monitoring trends in serum creatinine and BUN levels. As renal function becomes compromised, renal excretion of creatinine and other waste products, including magnesium sulfate, decreases. As renal function diminishes, serum levels of creatinine, BUN, uric acid, and magnesium increase. Proteinuria is usually a late sign in the course of preeclampsia (ACOG, 2002; Working Group, 2000).

Protein readings are designated as follows:

- 0: negative
- Trace: trace
- 1+: 30 mg/dl
- 2+: 100 mg/dl
- 3+: 300 mg/dl
- 4+: 1000 mg (1 g)/dl

Nursing diagnoses for the woman with hypertensive disorders in pregnancy may include the following:

- Anxiety related to:
  - preeclampsia and its effects on woman and infant
- Deficient knowledge related to:
  - management (diet, medications, activity restrictions)
- Ineffective individual or family coping related to:
  - woman’s restricted activity and concern over a complicated pregnancy
  - woman’s inability to work outside the home and care for her family
  - transfer of woman to tertiary care center for more intensive management

Expected Outcomes of Care

Expected outcomes for care of women with hypertensive disorders of pregnancy include that the woman will do the following:

- Recognize and immediately report signs and symptoms indicative of worsening condition
- Adhere to the medical regimen to minimize risk to herself and her fetus
- Identify and use available support systems
- Verbalize her fears and concerns to cope with the condition and situation
- Develop no signs of eclampsia and its complications
- Give birth to a healthy infant
- Develop no adverse sequelae from her condition or its management

Plan of Care and Interventions

Nursing actions are derived from medical management, health care provider directives, and nursing diagnoses. The most effective therapy is prevention. Early prenatal care, identification of pregnant women at risk, and recognition and reporting of physical warning signs are essential components for optimizing maternal and perinatal outcomes. The nurse’s skills in assessing the woman for factors and symptoms of preeclampsia and educating her about reporting symptoms cannot be overestimated.

The goals of therapy are to ensure maternal safety and to deliver a healthy newborn as close to term as possible. At or near term, the plan of care for a woman with preeclampsia is most likely to be induction of labor, preceded, if necessary, by cervical ripening. When preeclampsia is diagnosed in a woman at less than 37 weeks of gestation, however, immediate birth may not be in the best interest of the fetus. In this situation the initial intervention is usually a thorough evaluation of both the maternal and fetal condition. This evaluation may be done in the high risk clinic or the physician’s office. A multidisciplinary plan of care is then developed, based on the assessment findings.
Mild preeclampsia and home care

If the woman has mild preeclampsia (e.g., BP is stable, urine protein is less than 300 mg in a 24-hour collection, and woman has no subjective complaints), she may be managed expectantly, usually at home. The maternal-fetal condition must be assessed two to three times per week. Many agencies are available to provide this assessment in the home. Arrangements for this service may be made, depending on the woman’s insurance coverage. If home nursing care is not an option, the woman may be asked to perform self-assessment daily, including weight, urine dipstick protein determination, BP measurement, and fetal movement count. She will be instructed to report the development of any subjective symptoms immediately to her health care provider (Patient Instructions for Self-Care box) and to return to the physician’s office or high risk clinic for assessment as scheduled.

The fetal condition also is closely monitored to allow additional time for fetal growth and maturation. An evaluation of fetal growth by ultrasound should be obtained every 3 weeks. Fetal movement is counted daily. Other fetal assessment tests include an NST once or twice a week and a BPP as needed. Fetal jeopardy as evidenced by inappropriate growth or abnormal test results necessitates immediate interventions for birth (ACOG, 2002; Sibai, 2002; Working Group, 2000). Activity restriction. Bed rest in the lateral recumbent position is a standard therapy for preeclampsia and may improve uteroplacental blood flow during pregnancy. Bed rest has been shown to be beneficial in decreasing BP and promoting diuresis. However, recommendations for bed rest for all high risk pregnant women is becoming more controversial. Maloni and Kutil (2000) and Maloni (2002) doc-

PATIENT INSTRUCTIONS FOR SELF-CARE

Assessing and Reporting Clinical Signs of Preeclampsia

- Report to your health care provider immediately any increase in your blood pressure, protein in urine, weight gain greater than 1 lb/week, or edema.
- Take your blood pressure on the same arm in a sitting position each time for consistent and accurate readings. Support arm on a table in a horizontal position at heart level.
- Weigh yourself using the same scale, wearing the same clothes, at the same time each day, after voiding, before breakfast, for reliable daily weights.
- Dipstick test your clean-catch urine sample to assess proteinuria; report frequency of or burning on urination.
- Report to your health care provider if proteinuria is 2+ or more or if you have a decrease in urine output.
- Assess your baby's activity daily. Decreased activity (four or fewer movements per hour) may indicate fetal compromise and should be reported.
- It is important to keep your scheduled prenatal appointments so that any changes in your or your baby’s condition can be detected.
- Keep a daily log or diary of your assessments for your home health care nurse, or bring it with you to your next prenatal visit.
- Report to your health care provider immediately any headache, dizziness, blurring of vision or muscular irritability (seizures)
umented adverse physiologic outcomes related to complete bed rest, including cardiovascular deconditioning; diuresis with accompanying fluid, electrolyte, and weight loss; muscle atrophy; and psychologic stress. These changes begin on the first day of bed rest and continue for the duration of therapy. Sibai (2002) recommends rest at home, rather than strict bed rest, and allows a woman hospitalized with mild pre-eclampsia to be out of bed.

Women with mild preclampsia feel reasonably well; boredom from activity restriction is therefore common. Diversionsary activities, visits from friends, telephone conversations, and creation of a comfortable and convenient environment are ways to cope with the boredom (Patient Instructions for Self-Care box). Gentle exercise (e.g., range of motion, stretching, Kegel exercises, pelvic tilts) is important in maintaining muscle tone, blood flow, regularity of bowel function, and a sense of well-being (Maloni & Kutil, 2000; Maloni, 2002). Relaxation techniques can help reduce the stress associated with the high risk condition and prepare the woman for labor and birth.

Diet. Diet and fluid recommendations are much the same as for healthy pregnant women. Diets high in protein and low in salt have been suggested to prevent preeclampsia; however, the efficacy of this has not been proven. Sibai (2004) recommends a regular diet with no restriction of salt. The exception may be the woman with chronic hypertension that was successfully controlled with a low-salt diet before the pregnancy. Adequate fluid intake helps maintain optimum fluid volume and aids in renal perfusion and filtration. The nurse uses assessment data regarding the woman’s diet to counsel her in areas of deficiency, as needed (Patient Instructions for Self-Care box).

PATIENT INSTRUCTIONS FOR SELF-CARE

Coping with Bed Rest

QUESTIONS FOR HEALTH CARE PROVIDERS

Clarify with your health care provider: What is bedrest? Question your activity level, positioning, driving, bathroom privileges, working inside the home, child care activities, personal hygiene, mobility, stairs, diet, visitors, and sexual activity.

When should I contact my OB provider?

How often will I need to see my OB provider and what tests will be required and why?

If my pregnancy does not go term, where will I give birth and who will be my doctor and the baby’s doctor?

Will I need to take any medications at home? If so, why?

Will I have any home monitoring equipment or health care providers making home visits?

What symptoms would require me to go to the hospital?

SURVIVING BED REST—TIPS FOR HOME

Stock mini-fridge or cooler with healthy snacks and beverages. Develop a schedule and follow—pay bills on Monday, make a grocery list on Tuesday. Contact post office and delivery companies to allow them to leave packages with specific neighbors or ask that signature requirement be waived and packages left at door.

Have a TV and CD with remote, and record programs to watch when bored. Delegate responsibilities—laundry, pick up groceries, dry cleaning, meet repair people, child care, organize meals.

Have a portable phone bedside—schedule appoint-

ments by phone, parent teacher conferences. Have available:

• Post-it notes
• Cups with lids and flexible straws
• Paper plates
• Plastic forks, spoons, and knives
• Baby monitor or walkie talkies
• Wet wipes
• Big trashbasket
• Notebook to record questions for providers, phone numbers, to-do lists
• Rollable cart or easily moved crate to keep items organized
• Pillows and more pillows (body pillow)
• Eggcrate mattress
• Envelopes and stationery
• Take-out menus
• Telephone answering machine or service
• Reading materials
• Movies/CDs

Plan for family time—visits and interaction, particularly with small children

If possible, hire:

• Housecleaning
• Lawn care
• Child care assistance

Share trade magazines with friends.

Explore your interest in a new hobby—needlework, new reading content area.

Track your medicine—recording type/times/amount to minimize errors.

Monitor and record a daily fetal movement count. Question your OB provider regarding the availability of a physical therapist to minimize bed rest complications.

Identify relaxation exercises and activities (music) and implement.

Continued
Successful home care requires the woman to be well educated about preeclampsia and motivated to follow the plan of care. She must also be reliable about keeping appointments. The effects of illness, language, age, culture, beliefs, and support systems must be considered. The woman’s support systems must be mobilized and involved in planning and implementing her care (Plan of Care).

Severe preeclampsia and HELLP syndrome

If the woman’s condition worsens or she already has severe preeclampsia or HELLP syndrome and is critically ill, she should receive appropriate management (usually in a tertiary care center), ranging from immediate birth to conservative management of the pregnancy (ACOG, 2002; Sibai, 2004; Working Group, 2000). Recognition of the clinical and laboratory findings of severe preeclampsia or HELLP syndrome is important if early, aggressive therapy is to be initiated to prevent maternal and perinatal mortality. An unfavorable (uneffaced and undilated) cervix resulting from gestational age, the aggressive nature of this disorder, and the associated perinatal mortality support cesarean birth for these women.

The administration of magnesium sulfate as prophylaxis against seizures and an antihypertensive agent if diastolic BP is higher than 100 mm Hg to 110 mm Hg are important components of management. The woman with severe preeclampsia or HELLP syndrome has multiple problems, and nursing care must focus on both the mother and fetus.

PATIENT INSTRUCTIONS FOR SELF-CARE

Nutrition

- Eat a nutritious, balanced diet (80 to 70 g protein, 1200 mg calcium, and adequate zinc, magnesium, and vitamins). Consult with registered dietitian on the diet best suited for you as an individual.
- There is no sodium restriction; however, consider limiting excessively salty foods (luncheon meats, pretzels, potato chips, pickles, sauerkraut).
- Eat foods with roughage (whole grains, raw fruits, and vegetables).
- Drink six to eight 8-oz glasses of water per day.
- Avoid alcohol and tobacco, and limit caffeine intake.

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PATIENT INSTRUCTIONS FOR SELF-CARE—cont’d

Drink 6-8 glasses of water a day and eat foods high in fiber. Ask your health care provider if you may have a prenatal vitamin with a stool softener.

SURVIVING BED REST—TIPS FOR HOSPITAL

Clarify with your health care provider: What is bed rest. Question your activity level, positioning, bathroom privileges, children’s visits, activities, personal hygiene, mobility, diet, and visitors. In addition to survival tips for the home, the following may be useful in the hospital setting. Bring your own pillow, shampoo, and conditioner. Wheelchair for outside visits or visiting other antepartum patients.

Share/trade magazines with friends and other antepartal patients

If possible bring laptop with DVD capabilities to allow you to watch movies.

Ask friends to bring healthy food and snacks when visiting rather than flowers.

Explore your interest in a new hobby–needlework, new reading area.

Work with staff regarding scheduling–OB provider exams, vital signs, nursing assessments, etc.

Bring earplugs to block the hospital noise.

Ask for a room with a view.

Have a large calendar and clock for easy viewing. Record significant events on the calendar.

http://fpb.cwru.edu/Bedrest
http://www.momsonbedrest.com


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If the woman’s condition worsens or she already has severe preeclampsia or HELLP syndrome and is critically ill, she should receive appropriate management (usually in a tertiary care center), ranging from immediate birth to conservative management of the pregnancy (ACOG, 2002; Sibai, 2004; Working Group, 2000). Recognition of the clinical and laboratory findings of severe preeclampsia or HELLP syndrome is important if early, aggressive therapy is to be initiated to prevent maternal and perinatal mortality. An unfavorable (uneffaced and undilated) cervix resulting from gestational age, the aggressive nature of this disorder, and the associated perinatal mortality support cesarean birth for these women.

The administration of magnesium sulfate as prophylaxis against seizures and an antihypertensive agent if diastolic BP is higher than 100 mm Hg to 110 mm Hg are important components of management. The woman with severe preeclampsia or HELLP syndrome has multiple problems, and nursing care must focus on both the mother and fetus.

Hospital care. Antepartum care focuses on stabilization and preparation for birth. The woman may be admitted to an antepartum or a labor and birth unit, depending on the hospital. If the woman’s condition is severe, she may be placed in a medical intensive care unit for hemody-namic monitoring (ACOG, 2002). Maternal and fetal surveillance, patient education regarding the disease process, and supportive measures directed toward the woman and her family are initiated. Assessments include review of the cardiovascular system, pulmonary system, renal system, hematologic system, and CNS. Monitoring urinary output is critical because magnesium is excreted by the kidneys. Fetal assessments for well-being (e.g., NST, BPP, fetal movement counts) are important because of the potential for hypoxia related to uteroplacental insufficiency. Baseline laboratory assessments include metabolic studies for liver enzyme (AST, ALT, LDH) determination,
complete blood count with platelets, coagulation profile to assess for DIC, and electrolyte studies to establish renal functioning.

Weight is measured on admission and every day thereafter at the same time. An indwelling urinary catheter facilitates monitoring of renal function and effectiveness of therapy but is used only in women with severe preeclampsia, eclampsia, or HELLP syndrome. If appropriate, vaginal examination may be done to check for cervical changes. Abdominal palpation establishes uterine tonicity and fetal size, activity, and position. Electronic monitoring to determine fetal status is initiated at least once a day. The nurse’s skill in implementing the techniques described here can be reassuring to the woman and her family. The woman’s room must be close to staff and emergency drugs, supplies, and equipment. Noise and external stimuli must be minimized. Seizure precautions are taken (Box 23-4).

Bed rest or restricted activity is commonly ordered, although there is a lack of scientific evidence to support the efficacy of these restrictions (ACOG, 2002; Enkin et al., 2001). The nurse’s ingenuity may be called on to help the woman cope physically and psychologically with the side effects of immobility and an environment limited in stimuli and support. Thromboembolic events, a risk factor during normal pregnancy, pose an even greater risk with preeclampsia (Plan of Care).

Intrapartum nursing care of the woman with severe preeclampsia or HELLP syndrome involves continuous monitoring of maternal and fetal status as labor progresses. The assessment and prevention of tissue hypoxia and hemorhage, both of which can lead to permanent compromise of vital organs, continue throughout the intrapartum and postpartum periods (Sibai, 2004).

Magnesium sulfate. One of the important goals of care for the woman with severe preeclampsia is prevention or control of convulsions. Magnesium sulfate is the drug of choice in the prevention and treatment of convulsions caused by preeclampsia or eclampsia (ACOG, 2002; Cunningham et al., 2005; Nick, 2004). The routine use of magnesium sulfate is indicated for severe preeclampsia, HELLP syndrome, or eclampsia. However, no data support the routine use of magnesium sulfate for women diagnosed

### Nursing Interventions/Plan of Care—Mild Preeclampsia Home Care

**Nursing Diagnosis** Risk for injury related to imposed bed rest

**Expected Outcomes** Woman will verbalize diminished feelings of boredom.

**Nursing Interventions/Rationales**
- Assist woman to explore creative personally meaningful activities that can be pursued from the bed to promote activities that have meaning, purpose, and value to the individual.
- Maintain emphasis on personal choices of woman to promote control and minimize imposition of routines by others.
- Evaluate what support and system resources are available in the environment to assist in providing diversional activities.
- Explore ways for woman to remain an active participant in home management and decision making to promote control.
- Engage support of family and friends in carrying out chosen activities and making necessary environmental alterations to ensure success.
- Teach woman about stress management and relaxation techniques to help manage tension of confinement.

**Nursing Diagnosis** Fear or anxiety related to imposed bed rest

**Expected Outcomes** Woman’s feelings and symptoms of fear or anxiety will decrease or ease.

**Nursing Interventions/Rationales**
- Provide a calm, soothing atmosphere and teach family to provide emotional support to facilitate coping.
- Teach woman about stress management and relaxation techniques to promote control and minimize imposition of routines by others.
- Explore use of desensitization strategies such as progressive muscle relaxation, visual imagery, or thought stopping to reduce fear-related emotions and related physical symptoms.

**Plan of Care**

**Mild Preeclampsia: Home Care**

- Teach woman about use of rest and relaxation as palliative treatment options to decrease blood pressure and promote diuresis.
- Teach woman about stress management and relaxation techniques to help manage tension of confinement.

**NURSING DIAGNOSIS** Deficient diversional activity related to imposed bed rest

**Expected Outcome** Woman will verbalize diminished feelings of boredom.

**Nursing Interventions/Rationales**
- Provide a calm, soothing atmosphere and teach family to provide emotional support to facilitate coping.
- Teach woman about stress management and relaxation techniques to promote control and minimize imposition of routines by others.
- Explore use of desensitization strategies such as progressive muscle relaxation, visual imagery, or thought stopping to reduce fear-related emotions and related physical symptoms.

**Rationales**
- Ensure success.
with mild preeclampsia or gestational hypertension (Work- ing Group, 2000).

Magnesium sulfate is administered as a secondary infu- sion (piggyback) to the main intravenous (IV) line by volu-

metric infusion pump. An initial loading dose of 4 to 6 g of magnesium sulfate per protocol or physician’s order is in- fused over 15 to 20 minutes. This dose is followed by a main- tenance dose of magnesium sulfate that is diluted in an IV solution per physician’s order (e.g., 40 g of magnesium sul- fate in 1000 ml of lactated Ringer’s solution) and adminis- tered by infusion pump at 2 g/hr (Cunningham et al., 2005). This dose should maintain a therapeutic serum magnesium level of 4 to 7 mEq/L (Cunningham et al., 2005; Nick, 2004). Levels of magnesium sulfate are often checked daily (Gilbert & Harmon, 2003). After the loading dose, there may be a transient lowering of the arterial BP secondary to relaxation of smooth muscle by the magnesium sulfate. For the initial 24 hours postpartum, magnesium sulfate is usually contin- ued intravenously (Box 23-5).

Intramuscular (IM) magnesium sulfate is rarely used be- cause absorption rate cannot be controlled, injections are painful, and tissue necrosis may occur. However, the IM route may be used with some women who are being trans- ported to a tertiary care center. The IM dose is 4 to 5 g given in each buttock, a total of 10 g (with 1% procaine possibly

### BOX 23-4

#### Hospital Precautionary Measures

- **Environment**
  - Quiet
  - Nonstimulating
  - Lighting subdued
- **Seizure precautions**
  - Suction equipment tested and ready to use
  - Oxygen administration equipment tested and ready to use
- **Call button within easy reach**
- **Emergency medication tray immediately accessible**
- **Lighting subdued**
- **Nonstimulating**
- **Quiet**

**Rationale:**
These measures are needed to prevent injury to woman and fetus related to CNS irritability.

**Expected Outcome**
Woman will exhibit signs of increased vasodilation (e.g., diuresis, decreased edema, weight loss).

**Nursing Interventions/Rationales**
- Establish baseline data (e.g., DTRs, clonus) to use as basis for evaluating effectiveness of treatment.
- Administer IV magnesium sulfate per physician’s orders to increase hyperreflexia and minimize risk of convulsions.
- Monitor maternal vital signs, FHR, urine output, DTRs, IV flow rate, and serum levels of magnesium sulfate to assess for and prevent magnesium sulfate toxicity (e.g., depressed respi- rations, oliguria, sudden drop in blood pressure, hyporeflexia, fetal distress).
- Have calcium gluconate at bedside to use as antidote for magnesium sulfate toxicity.
- Maintain a quiet, darkened environment to prevent magnesium sulfate toxicity.

**Rationale:**
These measures are needed to prevent injury to woman and fetus related to CNS irritability.

**Expected Outcome**
Woman will exhibit signs of in- creased vasodilation (e.g., diuresis, decreased edema, weight loss).

**Nursing Interventions/Rationales**
- Establish baseline data (e.g., weight, degree of edema) to use as basis for evaluating effectiveness of treatment.
- Administer intravenous magnesium sulfate per physician order, which serves to relax vasospasms and increase renal perfusion.
- Place woman on bed rest in a side-lying position to maximize uteroplacental blood flow, reduce blood pressure, and pro- mote diuresis.

**Rationale:**
These measures are needed to prevent injury to woman and fetus related to vasospasm.

**Expected Outcome**
Woman will exhibit signs of normal fluid volume (i.e., balanced intake and output, normal serum creatinine levels, normal breath sounds), adequate oxygenation (i.e., normal respira- tions, full orientation to person, time, and place), normal range of cardiac output (i.e., normal pulse rate and rhythm), and fetal well-being (i.e., ade- quate fetal movement, normal FHR).

**Nursing Interventions/Rationales**
- Monitor woman for signs of fluid volume excess (increased edema, decreased urine output, elevated serum creatinine level, weight gain, dyspnea, cradles) to detect potential com- plications.
- Monitor woman for signs of impaired gas exchange (in- creased respirations, dyspnea, altered blood gases, hypox- emia) to detect potential complications.
- Monitor woman for signs of decreased cardiac output (al- tered pulse rate and rhythm) to detect potential complica- tions.
- Monitor fetus for signs of difficulty (decreased fetal activity, decreased FHR) to prevent complications.
- Record findings and report signs of increasing problems to physician to enable timely interventions.

**Rationale:**
These measures are needed to prevent injury to woman and fetus related to pulmonary edema secondary to administration of magnesium sulfate.

**Expected Outcome**
Woman will show diminished signs of CNS irritability (e.g., DTRs 2\(^{-}\), absence of clonus) and have no convulsions.

**Nursing Interventions/Rationales**
- Establish baseline data (e.g., DTRs, clonus) to use as basis for evaluating effectiveness of treatment.
- Administer IV magnesium sulfate per physician’s orders to increase hyperreflexia and minimize risk of convulsions.
- Monitor maternal vital signs, FHR, urine output, DTRs, IV flow rate, and serum levels of magnesium sulfate to assess for and prevent magnesium sulfate toxicity (e.g., depressed respi- rations, oliguria, sudden drop in blood pressure, hyporeflexia, fetal distress).
- Have calcium gluconate at bedside to use as antidote for magnesium sulfate toxicity.
- Maintain a quiet, darkened environment to prevent magnesium sulfate toxicity.

**Rationale:**
These measures are needed to prevent injury to woman and fetus related to CNS irritability.

**Expected Outcome**
Woman will exhibit signs of increased vasodilation (e.g., diuresis, decreased edema, weight loss).

**Nursing Interventions/Rationales**
- Establish baseline data (e.g., weight, degree of edema) to use as basis for evaluating effectiveness of treatment.
- Administer intravenous magnesium sulfate per physician order, which serves to relax vasospasms and increase renal perfusion.
- Place woman on bed rest in a side-lying position to maximize uteroplacental blood flow, reduce blood pressure, and pro- mote diuresis.

**Rationale:**
These measures are needed to prevent injury to woman and fetus related to vasospasm.

**Expected Outcome**
Woman will exhibit signs of normal fluid volume (i.e., balanced intake and output, normal serum creatinine levels, normal breath sounds), adequate oxygenation (i.e., normal respira- tions, full orientation to person, time, and place), normal range of cardiac output (i.e., normal pulse rate and rhythm), and fetal well-being (i.e., ade- quate fetal movement, normal FHR).

**Nursing Interventions/Rationales**
- Monitor woman for signs of fluid volume excess (increased edema, decreased urine output, elevated serum creatinine level, weight gain, dyspnea, cradles) to detect potential com- plications.
- Monitor woman for signs of impaired gas exchange (in- creased respirations, dyspnea, altered blood gases, hypox- emia) to detect potential complications.
- Monitor woman for signs of decreased cardiac output (al- tered pulse rate and rhythm) to detect potential complica- tions.
- Monitor fetus for signs of difficulty (decreased fetal activity, decreased FHR) to prevent complications.
- Record findings and report signs of increasing problems to physician to enable timely interventions.

**Rationale:**
These measures are needed to prevent injury to woman and fetus related to pulmonary edema secondary to administration of magnesium sulfate.

**Expected Outcome**
Woman will show diminished signs of CNS irritability (e.g., DTRs 2\(^{-}\), absence of clonus) and have no convulsions.

**Nursing Interventions/Rationales**
- Establish baseline data (e.g., DTRs, clonus) to use as basis for evaluating effectiveness of treatment.
- Administer IV magnesium sulfate per physician’s orders to increase hyperreflexia and minimize risk of convulsions.
- Monitor maternal vital signs, FHR, urine output, DTRs, IV flow rate, and serum levels of magnesium sulfate to assess for and prevent magnesium sulfate toxicity (e.g., depressed respi- rations, oliguria, sudden drop in blood pressure, hyporeflexia, fetal distress).
- Have calcium gluconate at bedside to use as antidote for magnesium sulfate toxicity.
- Maintain a quiet, darkened environment to prevent magnesium sulfate toxicity.

**Rationale:**
These measures are needed to prevent injury to woman and fetus related to CNS irritability.

**Expected Outcome**
Woman will exhibit signs of increased vasodilation (e.g., diuresis, decreased edema, weight loss).

**Nursing Interventions/Rationales**
- Establish baseline data (e.g., weight, degree of edema) to use as basis for evaluating effectiveness of treatment.
- Administer intravenous magnesium sulfate per physician order, which serves to relax vasospasms and increase renal perfusion.
- Place woman on bed rest in a side-lying position to maximize uteroplacental blood flow, reduce blood pressure, and pro- mote diuresis.
Magnesium sulfate interferes with the release of acetylcholine at the synapses, decreasing neuromuscular irritability, depressing cardiac conduction, and decreasing CNS irritability. Because magnesium circulates in a free state and unbound to protein and is excreted in the urine, accurate recordings of maternal urine output must be obtained and monitored. Diuresis is an excellent prognostic sign; however, if renal function declines, all of the magnesium sulfate will not be excreted and can cause magnesium toxicity.

Because magnesium sulfate is a CNS depressant, the nurse assesses for signs and symptoms of magnesium toxicity. Serum magnesium levels are obtained on the basis of the woman’s response and if any signs of toxicity are present. Expected side effects of magnesium sulfate are a feeling of warmth, flushing, and nausea. Symptoms of mild toxicity include lethargy, muscle weakness, decreased DTRs, and slurred speech. Increasing toxicity may be indicated by maternal hypotension, bradycardia, bradypnea, and heart block (Nick, 2004).

NURSE ALERT
Loss of patellar reflexes, respiratory depression, oliguria, and decreased level of consciousness are signs of magnesium toxicity. Actions are needed to prevent respiratory or cardiac arrest. If magnesium toxicity is suspected, the infusion should be discontinued immediately. Calcium gluconate, the antidote for magnesium sulfate, may also be ordered (10 ml of a 10% solution, or 1 g) and given by slow IV push (usually by the physician) over at least 3 minutes to avoid undesirable reactions such as arrhythmias, bradycardia, and ventricular fibrillation (Cunningham et al., 2005; Nick, 2004; Sibai, 2002).
Magnesium sulfate does not seem to affect FHR in a healthy term fetus. Neonatal serum magnesium levels approximate those levels of the mother (Cunningham et al., 2005). Magnesium sulfate dosage levels adequate to prevent maternal seizures have been determined to be safe for the fetus with neonatal levels nearly equal with maternal levels (Cunningham et al., 2005). Toxic levels in the newborn can cause neonatal depression and occur with “severe” hypermagnesemia at birth (Cunningham et al., 2005). Although rarely needed, calcium and exchange transfusion with mechanical ventilation can be used to treat infants with hypermagnesemia. Long-term effects of magnesium administration on mothers and infants is under study (Magee Trial Follow-Up Study Management, 2004).

**Eclampsia**

If eclampsia develops after the initiation of magnesium sulfate therapy, additional magnesium sulfate or another anticonvulsant (e.g., diazepam) may be administered (Roberts, 2004). With adequate blood magnesium levels, the eclamptic woman will rarely continue to have seizures. Approximately 20% of women with eclampsia do not follow the progression from mild disease to convulsion with the abrupt onset of seizures (Sibai, Dekker, & Kupferminc, 2005). However, diazepam is not without fetal and neonatal effects. The drug of choice, magnesium sulfate (e.g., 2 to 4 g) is given via IV push and repeated every 15 minutes with a maximum of 6 g. Alternatively another anticonvulsant other than magnesium sulfate such as diazepam may be given (ACOG, 2002; Cunningham et al., 2005; Sibai, Dekker, & Kupferminc, 2005). If an IV is not already infusing then one is begun with approximately those levels of the mother (Cunningham et al., 2005). The choice of agent used depends on patient response and physician preference. Table 23-5 compares antihypertensive agents used to treat hypertension in pregnancy.

**Control of blood pressure.** For the severely hypertensive preeclamptic woman, antihypertensive medications may be ordered to lower the diastolic BP. Initiation of antihypertensive therapy reduces maternal morbidity and mortality rates associated with left ventricular failure and cerebral hemorrhage. Because a degree of maternal hypertension is necessary to maintain uteroplacental perfusion, antihypertensive therapy must not decrease the arterial pressure too much or too rapidly. The target range for the diastolic pressure is therefore less than 110 mm Hg and the systolic pressure is therefore less than 160 mm Hg (ACOG, 2002; Cunningham et al., 2005; Sibai, Dekker, & Kupferminc, 2005).

IV hydralazine remains the antihypertensive agent of choice for the treatment of hypertension in severe pre-eclampsia (ACOG, 2002; Cunningham et al., 2005). IV labetalol hydrochloride, nifedipine, verapamil, and oral methyldopa are also used (ACOG, 2002; Cunningham et al., 2005). The choice of agent used depends on patient response and physician preference. Table 23-5 compares antihypertensive agents used to treat hypertension in pregnancy.

Because magnesium sulfate is also a tocolytic agent, its use may increase the duration of labor. A preeclamptic woman receiving magnesium sulfate may need augmentation with oxytocin during labor. The amount of oxytocin needed to stimulate labor may be more than that needed for a woman who is not receiving magnesium sulfate.

**Immediate care.** The immediate care during a convolution is to ensure a patent airway and maintain oxygenation (Emergency box). When convulsions occur, the woman is turned onto her side to prevent aspiration of vomitus and supine hypotension syndrome. After the convulsion ceases, food and fluid are suctioned from the glottis or trachea, and oxygen is administered by face mask. The drug of choice, magnesium sulfate (e.g., 2 to 4 g) is given via IV push and repeated every 15 minutes with a maximum of 6 g. Alternatively another anticonvulsant other than magnesium sulfate such as diazepam may be given (ACOG, 2002; Cunningham et al., 2005; Sibai, Dekker, & Kupferminc, 2005). If an IV is not already infusing then one is begun with at least an 18-gauge needle. Time, duration, and description of convulsions are recorded, and any urinary or fecal incontinence is noted. The fetus is monitored for adverse effects. Transient fetal bradycardia, decreased FHR variability, and compensatory tachycardia are common.
Aspiration is a leading cause of maternal morbidity and mortality after eclamptic seizure. After initial stabilization and airway management, the nurse should anticipate orders for a chest radiograph and possibly arterial blood gases to rule out the possibility of aspiration.

A rapid assessment of uterine activity, cervical status, and fetal status is performed after a convulsion. During the convulsion, membranes may have ruptured; the cervix may have dilated because the uterus becomes hypercontractile and hypertonic; and birth may be imminent. If not, once a woman’s seizure activity and BP are controlled, a decision should be made regarding whether birth should take place. The target levels for blood pressure management are a systolic blood pressure between 140 mm Hg and 160 mm Hg and a diastolic between 90 mm Hg and 110 mm Hg. Blood pressure may be managed with hydralazine (10 mg doses) or...
UNIT SEVEN  COMPLICATIONS OF CHILDBEARING

Eclampsia

**Tonic-clonic convulsion signs**
- Stage of invasion: 2 to 3 sec, eyes are fixed, twitching of facial muscles occurs
- Stage of contraction: 15 to 20 sec, eyes protrude and are bloodshot, all body muscles are in tonic contraction
- Stage of convolution: muscles relax and contract alternately (clonic), respirations are halted and then begin again with long, deep, stertorous inhalation, coma ensues

**INTERVENTION**
- Keep airway patent: turn head to one side, place pillow under one shoulder or back if possible
- Call for assistance
- Protect with side rails up
- Observe and record convulsion activity

**AFTER CONVULSION OR SEIZURE**
- Do not leave unattended until fully alert
- Observe for postconvulsion coma, incontinence
- Use suction as needed
- Administer oxygen via face mask at 10 L/min
- Start intravenous fluids, and monitor for potential fluid overload
- Give magnesium sulfate or other anticonvulsant drug as ordered
- Insert indwelling urinary catheter
- Monitor fetal and uterine status
- Expedite laboratory work as ordered to monitor kidney function, liver function, coagulation system, and drug levels
- Provide hygiene and a quiet environment
- Support and keep woman and family informed
- Be prepared for assisting with birth when woman is in stable condition

The woman may have been incontinent of urine and stool during the convulsion; she will need assistance with hygiene and a change of gown. Oral care with a soft toothbrush may be of comfort.

Immediately after a seizure, the woman may be confused and can be combative, necessitating the temporary use of restraints. It may take several hours for the woman to regain her usual level of mental functioning. The health care provider explains procedures briefly and quietly. The woman is never left alone. The family is also kept informed of management, rationale for treatment, and the woman’s progress.

Laboratory tests are ordered to assess for HELLP syndrome and to have blood typed and crossmatched for administration of packed red blood cells as needed. Blood is available for emergency transfusion because abruptio placentae, with accompanying hemorrhage and shock, often occurs in women with eclampsia. Other tests include determination of electrolyte levels, liver function battery, and complete hemogram and clotting profile, including platelet count and fibrin split product levels (to assess for DIC).

If the maternal-fetal dyad’s condition deteriorates, a urinary catheter is inserted, and, to monitor fluid status, measurement of central venous pressure (CVP) or pulmonary artery wedge pressure (PAWP) may be required.

**Postpartum nursing care**

After birth the symptoms of preeclampsia or eclampsia resolve quickly, usually within 48 hours. The hematopoietic and hepatic complications of HELLP syndrome may persist longer. Afflicted patients often show an abrupt decrease in platelet count, with a concomitant increase in LDH and AST levels, after a trend toward normalization of values has begun. Generally the laboratory abnormalities seen with HELLP syndrome resolve in 72 to 96 hours.

The nursing care of the woman with hypertensive disease differs from that required in the usual postpartum period in a number of respects. The following variations in the nursing process are described.

Careful assessment of the woman with a hypertensive disorder continues throughout the postpartum period. Nursing care will include monitoring of vital signs, increased amounts of intravenous fluids intrapartally and postpartum and subsequent monitoring of intake and output and close monitoring of symptoms. BP is measured at least every 4 hours for 48 hours or more frequently as the woman’s condition warrants. Even if no convulsions occurred before the birth, they may occur within this period. Magnesium sulfate infusion may be continued 24 hours after the birth. Assessments for effects and side effects continue until the medication is discontinued.

Later postpartum eclampsia is eclampsia occurring after 48 hours but prior to 4 postpartal weeks. These women may present with clinical manifestations of preeclampsia intrapartum or during the immediate postpartum though other women present with the initial symptoms and convulsions after 48 hours postpartum (Sibai, Dekker, & Kupferminc, 2005).

The more serious the condition of the woman, the greater the need to proceed to birth. The route of birth induction of labor versus cesarean birth—depends on maternal and fetal condition, fetal gestational age, presence of labor and the cervical Bishop score (Sibai, Dekker, & Kupferminc, 2005). In pregnancies of less than 34 weeks of gestation, antenatal corticosteroids may be given to promote fetal lung maturation. If the birth can be delayed for 48 hours postpartum (Sibai, Dekker, & Kupferminc, 2005). Generally anesthesis is generally not recommended as there is an increased risk of aspiration but maternal pain can be controlled with epidural anesthesia or systemic opioids. Regional anesthesis is not recommended for eclamptic women with coagulopathy or a platelet count less than 50,000 (Sibai, Dekker, & Kupferminc, 2005).

Later postpartum eclampsia is eclampsia occurring after 48 hours but prior to 4 postpartal weeks. These women may present with clinical manifestations of preeclampsia intrapartum or during the immediate postpartum though other women present with the initial symptoms and convulsions after 48 hours postpartum (Sibai, Dekker, & Kupferminc, 2005).
perimposed pre eclampsia, and an increased perinatal death rate (threefold to fourfold) (Cunningham et al., 2005). Fetal effects include fetal growth restriction and small-for-gestational-age (SGA) infants (Cunningham et al., 2005; Livingston & Sibai, 2001; Roberts, 2004). Ideally, women with chronic hypertension should be screened preconceptionally. Medications that may be teratogenic, such as angiotensin converting enzyme inhibitors, should be reviewed (Peters & Flack, 2004). Women who are at high risk are usually managed with antihypertensive therapy and frequent assessments of maternal and fetal well-being. Methyldopa (Aldomet) is usually the drug of choice, although beta-blockers and calcium channel blockers are also used (Chan & Johnson, 2006; Cunningham et al., 2005; Working Group, 2000). Women at low risk for complications may be monitored closely, and antihypertensive therapy used as needed. As for any individual with hypertension, lifestyle changes are recommended. These changes include limiting sodium intake, performing exercise as appropriate, ingesting a balanced diet, limiting caffeine intake, and avoiding alcohol and tobacco (Gilbert & Harmon, 2003). Women at low risk may be induced at approximately 40 weeks of gestation. In contrast, women at high risk are followed closely, and method and timing of birth are dependent on maternal and fetal status. Postpartally, women with chronic hypertension are at risk for complications such as renal failure, pulmonary edema, and heart failure. In addition, BP should be closely evaluated at the 6-week postpartum visit to ascertain need for antihypertensive therapy. As all antihypertensive medications are found in breast milk, the drug of choice for women desiring to breastfeed primarily is methyldopa.

Evaluation

Evaluation of the effectiveness of care of the woman with high blood pressure in pregnancy is based on the expected outcomes.

**HYPEREMESIS GRAVIDARUM**

Nausea and vomiting complicate approximately 70% of all pregnancies beginning typically at 4 to 8 weeks of gestation and are generally confined to the first trimester or the first 16 to 20 weeks of gestation, peaking from 8 to 12 weeks of gestation (Cunningham et al., 2005; Scott & Abu-Hamda, 2004). Although these manifestations are distressing, they are typically benign, with no significant metabolic alterations or risks to the mother or fetus. Theories include increasing levels of estrogens, human chorionic gonadotropin, transient maternal hyperthyroidism, stress and interrelated psychosocial components (Davis, 2004; Meighan & Wood, 2004; Scott & Abu-Hamda, 2004).

When vomiting during pregnancy becomes excessive to cause weight loss of at least 5% of prepregnancy weight and is accompanied by dehydration, electrolyte imbalance, ketosis, and acetonuria, the disorder is termed **hyperemesis gravidarum**. The estimated incidence varies

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**NURSE ALERT** The woman is at risk for a boggy uterus and a large lochia flow as a result of the magnesium sulfate therapy. Uterine tone and lochial flow must be monitored closely.

The preeclamptic woman is unable to tolerate excessive postpartum blood loss because of hemoconcentration. Oxytocin or prostaglandin products are used to control bleeding. Ergot products (e.g., Ergotrate, Methergine) are contraindicated because they can increase BP. The woman is asked to report symptoms such as headaches and blurred vision. The nurse assesses AOG, BP, pulse, and respiratory status before an analgesic is given for headache. Magnesium sulfate potentiates the action of narcotics, CNS depressants, and calcium channel blockers; these drugs must be administered with caution. The woman may need to continue an antihypertensive medication regimen if her diastolic BP exceeds 100 mm Hg at hospital discharge.

The woman’s and family’s responses to labor, birth, and the neonate are monitored. Interactions and involvement in the care of the neonate are encouraged to the extent that the woman and her family desire. In addition, the woman and her family need opportunities to discuss their emotional response to complications. The nurse provides information concerning the prognosis. There is a sevenfold increase in the risk of recurrence of preeclampsia and eclampsia in women who developed preeclampsia or eclampsia in their first pregnancy (Dukkitt & Harrington, 2005).

**Prevention**

Early prenatal care for identification of women at risk and early detection of development of preeclampsia is the best prevention because there is no known etiology for preeclampsia. There have been numerous clinical trials studying various methods for prevention. These interventions included the use of low-dose aspirin, antioxidants, calcium, magnesium, zinc, and fish oil dietary supplementation, protein or sodium restriction, heparin or low molecular weight heparin administration and antihypertensive medications in women with chronic hypertension (Sibai, Dekker, & Kupferminc, 2005). Continued research is necessary to identify strategies to reduce the incidence or severity of preeclampsia in healthy pregnant women. Nurses should be aware of what strategies are being studied and use the most reliable evidence about the results so that they can counsel pregnant women about interventions that are evidenced based and likely to be beneficial (Enkin et al., 2001). One excellent resource for evidence-based care is the Cochrane Pregnancy and Childbirth Database (Callister & Hobkins-Garrett, 2000).

**Chronic hypertension**

Chronic hypertension occurs in up to 5% of pregnant women, with the incidence higher in African-American women and in women older than 40 years of age (Livingston & Sibai, 2001). Chronic hypertension in pregnancy is associated with increased incidence of abruptio placentae, suppurative preeclampsia, and an increased perinatal death rate (threefold to fourfold) (Cunningham et al., 2005). Fetal effects include fetal growth restriction and small-for-gestational-age (SGA) infants (Cunningham et al., 2005; Livingston & Sibai, 2001; Roberts, 2004). Ideally, women with chronic hypertension should be screened preconceptionally. Medications that may be teratogenic, such as angiotensin converting enzyme inhibitors, should be reviewed (Peters & Flack, 2004). Women who are at high risk are usually managed with antihypertensive therapy and frequent assessments of maternal and fetal well-being. Methyldopa (Aldomet) is usually the drug of choice, although beta-blockers and calcium channel blockers are also used (Chan & Johnson, 2006; Cunningham et al., 2005; Working Group, 2000). Women at low risk for complications may be monitored closely, and antihypertensive therapy used as needed. As for any individual with hypertension, lifestyle changes are recommended. These changes include limiting sodium intake, performing exercise as appropriate, ingesting a balanced diet, limiting caffeine intake, and avoiding alcohol and tobacco (Gilbert & Harmon, 2003). Women at low risk may be induced at approximately 40 weeks of gestation. In contrast, women at high risk are followed closely, and method and timing of birth are dependent on maternal and fetal status. Postpartally, women with chronic hypertension are at risk for complications such as renal failure, pulmonary edema, and heart failure. In addition, BP should be closely evaluated at the 6-week postpartum visit to ascertain need for antihypertensive therapy. As all antihypertensive medications are found in breast milk, the drug of choice for women desiring to breastfeed primarily is methyldopa.

Evaluation

Evaluation of the effectiveness of care of the woman with high blood pressure in pregnancy is based on the expected outcomes.
from 3.3 to 10 per 1000 births (Scott & Abu-Hamda, 2004). Approximately 1% of women require hospitalization. Hyperemesis gravidarum usually begins during the first 10 weeks of pregnancy. Hyperemesis gravidarum has been associated with women who are nulliparous, have increased body weight, have a history of migraines, are pregnant with twins (Davis, 2004; Scott & Abu-Hamda, 2004), or hydatidiform mole (Berman, El-Saai, & Tewari, 2004). In addition, an interrelated psychologic component has been associated with hyperemesis and must be assessed. (Cunningham et al., 2005; Scott & Abu-Hamda, 2004). The effects of hyperemesis gravidarum on perinatal outcome vary with the severity of the disorder. Women with hyperemesis gravidarum have a decreased risk of miscarriage (Scott & Abu-Hamda, 2004).

Etiology

The etiology of hyperemesis gravidarum remains obscure. Several theories have been proposed as to the cause, although none of them adequately explains the disorder. Hyperemesis gravidarum may be related to high levels of estrogen or human chorionic gonadotropin (hCG) and may be associated with transient hyperthyroidism during pregnancy. Some research has found a woman who has severe nausea and vomiting has a 1.5 increased chance of carrying a female infant, supporting the association between increased estrogen exposure and hyperemesis gravidarum (Cunningham, et al., 2005; Davis, 2004). Esophageal reflux, reduced gastric motility, and decreased secretion of free hydrochloric acid may contribute to the disorder. Psychosocial factors also may play a part in the development of hyperemesis gravidarum for some women. Ambivalence toward the pregnancy and increased stress may be associated with hyperemesis gravidarum (Cunningham et al., 2005; Davis, 2004; Scott & Abu-Hamda, 2004). Conflicting feelings regarding prospective motherhood, body changes, and lifestyle alterations may contribute to episodes of vomiting, particularly if these feelings are excessive or unresolved.

Clinical Manifestations

The woman with hyperemesis gravidarum usually has significant weight loss and dehydration. She may have a decreased BP, increased pulse rate, and poor skin turgor (Scott & Abu-Hamda, 2004). She frequently is unable to keep down clear liquids taken by mouth. Laboratory tests that may be ordered are a urinalysis, a complete blood cell count, electrolytes, liver enzymes, and bilirubin levels. These tests help rule out the presence of underlying diseases such as pylonephritis, pancreatitis, cholecystitis, and hepatitis (Cunningham et al., 2005). Because of the recognized association between hyperemesis gravidarum and hyperthyroidism, thyroid levels may also be measured (Scott & Abu-Hamda, 2004).

Psychosocial assessment includes asking the woman about anxiety, fears, and concerns related to her own health and the effects on pregnancy outcome. Family members should be assessed both for anxiety and with regard to their role in providing support for the woman.

Initial care

Initially, the woman who is unable to keep down clear liquids by mouth will require IV therapy for correction of fluid and electrolyte imbalances. She should be kept on nothing-by-mouth (NPO) status until dehydration has been resolved and for at least 48 hours after vomiting has stopped to prevent rapid recurrence of the problem. In the past, women requiring IV therapy were admitted to the hospital. Today, however, they may be, and often are, successfully managed at home, even if on enteral therapy. Medications may be used if nausea and vomiting are uncontrolled. The most frequently prescribed drugs include pyridoxine (B6) (25 mg to 75 mg daily) alone or in combination with doxylamine (Unisom) (25 mg), promethazine (Phenergan), and metoclopramide (Reglan) (ACOG, 2004a; Cunningham et al., 2005; Weiner & Buhimschi, 2004). Other less commonly used drugs include meclizine (Antivert), dimenhydrinate (Dramamine), diphenhydramine (Benadryl), prochlorperazine (Compazine), and ondansetron (Zofran) (Cunningham et al., 2005). Corticosteroids (methylprednisolone [Medrol]) may also be used to treat refractory hyperemesis gravidarum (Cunningham et al., 2005). Lastly, enteral or parenteral nutrition may be used for women nonresponsive to other medical therapies (Cunningham et al., 2005). In addition to medical management, some women can also benefit from Collaborative Care Whenever a pregnant woman has nausea and vomiting, the first priority is a thorough assessment to determine the severity of the problem. In most cases the woman should be told to come immediately to the health care provider’s office or to the emergency department, because the severity of the illness is often difficult to determine by phone conversation. The assessment should include frequency, severity, and duration of episodes of nausea and vomiting. If the woman reports vomiting, then the assessment should also include the approximate amount and color of the vomitus. Other symptoms such as diarrhea, indigestion, and abdominal pain or distention are also identified. The woman is asked to report any precipitating factors relating to the onset of her symptoms. Any pharmacologic or nonpharmacologic treatment measures should be recorded. Prepregnancy weight and documented weight gain or loss during pregnancy are important to note. The woman’s weight and vital signs are measured and a complete physical examination is performed, with attention to signs of fluid and electrolyte imbalance and nutritional status. The most important initial laboratory test to be obtained is a dipstick determination of ketonuria. Other laboratory tests that may be ordered are a urinalysis, a complete blood cell count, electrolytes, liver enzymes, and bilirubin levels. These tests help rule out the presence of underlying diseases such as pylonephritis, pancreatitis, cholecystitis, and hepatitis (Cunningham et al., 2005). Because of the recognized association between hyperemesis gravidarum and hyperthyroidism, thyroid levels may also be measured (Scott & Abu-Hamda, 2004).
pychologists or stress reduction techniques (Scott & Abu-
Hameda, 2004). Once the vomiting has stopped, feedings are
started in small amounts at frequent intervals, and the diet
is slowly advanced as tolerated until the woman can con-
sume a nutritionally sound diet.

Nursing care of the woman with hyperemesis gravidarum
involves implementing the medical plan of care, whether this
care be given in the hospital or home setting. Interventions
may include initiating and monitoring IV therapy, adminis-
tering drugs and nutritional supplements, and monitoring
the woman’s response to interventions. The nurse observes
the woman for any signs of complications such as metabolic aci-
dosis (secondary to starvation), jaundice, or hemorrhage and
alerts the physician should these occur. Monitoring includes
assessment of the woman’s nausea, retching without vomit-
ing, and vomiting as the two symptoms while related are
separate. A standardized assessment tool such as the PUQE
(pregnancy-unique quantification of emesis and nausea) al-
 lows quantification of the presence and severity of the nau-
sea and vomiting and promotes accurate monitoring (Davis,
2004).

Accurate measurement of intake and output, including the
amount of emesis, is an important aspect of care. Oral
hygiene while the woman is receiving nothing by mouth,
and after episodes of vomiting, helps allay associated dis-
comforts. Assistance with positioning and providing a quiet,
restful environment, free from odors, may increase the
woman’s comfort. When the woman begins responding to
therapy, limited amounts of oral fluids and bland foods such
as crackers, toast, or baked chicken are begun. The diet is pro-
gressed slowly as tolerated by the woman until she is able
to consume a nutritional diet. Because sleep disturbances
may accompany hyperemesis gravidarum, promoting ade-
quate rest is important. The nurse can assist in coordinating
treatment measures and periods of visitation to provide op-
portunity for rest periods.

Follow-up Care

Most women are able to take nourishment by mouth af-
 ter several days of treatment. Women should be encouraged
to eat small, frequent meals consisting of low-fat, high-
protein foods; to avoid greasy and highly seasoned foods;
and to increase dietary intake of potassium and magnesium.
Herbal teas such as ginger, chamomile, or raspberry leaf may
 decrease nausea (Nutting 2006; Jewell & Young, 2003; Smith,
Crowther, Willson, Hotham, & McMillan, 2004; Tiran &
Mack, 2000). Many pregnant women find exposure to cook-
ing odors nauseating. Having other family members cook
may lessen the woman’s nausea and vomiting, even if only
temporarily. Dietary instructions include ingestion of dry,
 bland foods, high protein foods, small, frequent meals, cold
 foods, of a snack before bedtime, drinking liquids from a cup
 with a lid, and tea or water with lemon slices, and avoidance
of high fat or spicy foods (Davis, 2004). The woman is coun-
seled to contact her health care provider if the nausea and
vomiting recur. Complications accompanying severe
hyperemesis gravidarum include esophageal rupture, and
deficiencies of vitamin k and thiamine with resulting Wer-
nicke encephalopathy (central nervous system involvement)
(Cunningham et al., 2005).

A few women will continue to experience intractable nau-
sea and vomiting throughout pregnancy. Rarely, it may be
necessary to maintain a woman on enteral, parenteral, or ro-
tal parenteral nutrition to ensure adequate nutrition for the
mother and fetus (Cunningham et al., 2005). Many home
health agencies are able to provide these services, and
arrangements for service may be made depending on the
woman’s insurance coverage.

The woman with hyperemesis gravidarum needs calm,
compassionate, and sympathetic care, with recognition that
the manifestations of hyperemesis can be physically and
emotionally debilitating to the patient and stressful for the
family. Irritability, tearfulness, and mood changes are often
consistent with this disorder. Fetal well-being is a primary
concern of the woman. The nurse can provide an environ-
ment conducive to discussion of concerns and assist the
woman and family in identifying and mobilizing sources of
support. The family should be included in the plan of care
whenever possible. Their participation may help alleviate
some of the emotional stress associated with this disorder.

HEMORRHAGIC COMPLICATIONS

Bleeding in pregnancy may jeopardize both maternal and fe-
tal well-being and is the second leading cause of pregnancy-
related death (Chang et al., 2003). Ectopic pregnancy rup-
ture and abruptio placenta being responsible for most
maternal deaths. Maternal blood loss decreases oxygen-
carrying capacity, which predisposes the woman to increased
risk for hypovolemia, anemia, infection, preterm labor, and
preterm birth and adversely affects oxygen delivery to the
fetus. Fetal risks from maternal hemorrhage include blood
loss or anemia, hypoxemia, hypoxia, anoxia, and preterm
birth. Hemorrhagic disorders in pregnancy are medical emer-
gencies. The incidence and type of bleeding vary by
season. In the first trimester, most bleeding is a result of
miscarriage and ectopic pregnancy. Approximately 50% of
bleeding in the third trimester is caused by placenta previa
and abruptio placenta.

Early Pregnancy Bleeding

Bleeding during early pregnancy is alarming to the woman
and of concern to the health care provider and nurse. The
common bleeding disorders of early pregnancy include mis-
carriage, incompetent cervix, ectopic pregnancy, and
hematidiform mole (molar pregnancy).

Miscarriage

Miscarriage is a pregnancy that ends before 20 weeks of
gestation. Twenty weeks of gestation is considered the point

Chapter 23

Pregnancy at Risk: Gestational Conditions

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Advisability of Routine Bed Rest for Multiple Pregnancy

BACKGROUND
- Since the early 1950s, it has been standard practice to admit all women pregnant with twins to the hospital for bed rest to prolong pregnancy, improve fetal growth, and manage labor. Although multiple pregnancy is associated with perinatal death as a result of preterm birth and intrauterine growth restriction, no controlled trials provided evidence of benefit from hospitalization. Half a century later, it is still widely accepted. Women frequently reported that the hospitalization and bed rest was distressing and disruptive to their families. Hospitalization is costly, and staffing resources are limited.

OBJECTIVES
- The reviewers’ goals were to determine the effects of the intervention (routine hospitalization for bed rest of women with multiple pregnancies) on the outcomes of preterm birth, perinatal death, perinatal morbidity, and women’s satisfaction with care.

METHODS
Search Strategy
- The reviewers searched the Cochrane database. Search keywords were hospital, pregnancy, multiple pregnancy, twin pregnancy, triplet pregnancy, and combinations of these words.
- Six randomized, controlled trials met the selection criteria. The trials represented 600 women and 1400 babies from Zimbabwe, Finland, and Australia and were conducted from 1985 to 1991.

Statistical Analyses
- Similar data were pooled. Reviewers calculated relative risks for dichotomous data, and weighted mean differences for continuous data. Results outside the 95% range were accepted as significant differences.

FINDINGS
- Routine hospitalization for bed rest for women with multiple pregnancies did not result in a decrease in preterm birth. There was equivocal evidence of a trend toward decreased low birth weight. There were no differences in very-low-birth-weight (less than 1500 g) infants between groups. The hospitalized group did not have a lower rate of low Apgar score (less than 7), need for admission to the neonatal unit, or a stay of 7 days or more. Some equivocal evidence showed a decreased risk of hypertension in hospitalized women. One trial measured psychosocial outcomes and reported that 6% “appreciated admission,” whereas 18% found it “distressing.”

• In twin pregnancies, significantly more hospitalized women gave birth very preterm (less than 34 weeks), and there was a nonsignificant trend toward lower gestation ages at birth than controls. No difference was found in perinatal mortality rate.
• In triplet pregnancies, hospitalization showed more beneficial effects and a trend toward decreased very-low-birth-weight births, although the results did not reach significance.
• Twin pregnancies with cervical effacement and dilation before labor showed no differences between the hospitalized group and the controls in any outcomes.

LIMITATIONS
- The small number of studies and small sample sizes limit the power of the study to draw conclusions. Four of the trials took place in Zimbabwe, and all the trials are more than a decade old, further limiting their generalizability. There were some randomization problems. No information about costs was reported.

CONCLUSIONS
- There is no evidence that supports recommending a policy of routine hospitalization for bed rest for women with multiple pregnancies.

IMPLICATIONS FOR PRACTICE
- A policy of routine hospitalization for bed rest for women with multiple pregnancies may, in fact, cause harm by increasing the risk of very preterm births in twins. There was some evidence of beneficial effects for triplets, but it could not be determined if the effects were attributable to chance alone. Some women found the hospitalization distressing. When women are hospitalized because of multiple gestation, nurses can support them and help them deal with the inactivity and boredom that occur. Families can be included. The woman and her family need to be kept informed of the condition of the fetuses.

IMPLICATIONS FOR FURTHER RESEARCH
- Important long-term developmental outcome of the infants remains unknown. Only one trial addressed the psychosocial effects of hospitalization, yet it is very disruptive to the family, leaving other family members to not only care for the woman, but also perform the family duties she cannot perform. Hospitalization frequently puts a financial burden on the family because of medical costs and lost income. Any future research should include these burdens and costs in their outcomes.

of viability, or when the fetus is able to survive in an extrauterine environment. A fetal weight of less than 500 g may also be used to define miscarriage (Cunningham et al., 2005).

A spontaneous abortion results from natural causes. **Miscarriage** is the term frequently used with women and their families, as the term abortion may be perceived as an elective, induced abortion despite the definition and may therefore be objectionable to the family. In this text, the term miscarriage is used to refer to a natural pregnancy loss, and abortion is used when discussing therapeutic or elective, induced abortion (see Chapter 6).

**Incidence and etiology.** Approximately 15% of all clinically recognized pregnancies end in miscarriage (Simpson, 2002). The majority—greater than 80% of miscarriages—occur before 12 weeks of gestation (Cunningham et al., 2005). Of all clinically recognized pregnancy losses, 50% to 60% result from chromosomal abnormalities (Cunningham et al., 2005; Hill, 2004; Simpson, 2002). An early miscarriage is defined as pregnancy loss before 8 weeks of gestation. The causes of early miscarriage include endocrine imbalance (as in women who have luteal phase defects or insulin-dependent diabetes mellitus with high blood glucose levels in the first trimester), immunologic factors (such as antiphospholipid antibodies), infections (such as bacteriuria and Chlamydia trachomatis infection), systemic disorders (such as lupus erythematosus), and genetic factors (Gilbert & Harmon, 2003; Hill, 2004).

A late miscarriage (pregnancy loss between 12 and 20 weeks of gestation) usually results from maternal causes, such as advancing maternal age and parity, chronic infections, premature dilation of the cervix and other anomalies of the reproductive tract, chronic debilitating diseases, poor nutrition, and recreational drug use (Cunningham et al., 2005). Little can be done to avoid genetically caused pregnancy loss, but correction of maternal disorders, immunization against infectious diseases, adequate early prenatal care, and treatment of pregnancy complications can do much to prevent miscarriage.

**Types.** The types of miscarriage include threatened, inevitable, incomplete, complete, and missed. Miscarriages (both early and late) can recur; all but the threatened miscarriage can lead to infection (Fig. 23-6).

**Clinical manifestations.** Signs and symptoms of miscarriage depend on the duration of pregnancy. The presence of uterine bleeding, uterine contractions, and uterine pain are ominous signs that must be considered a threatened miscarriage until proven otherwise.

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If miscarriage occurs before the sixth week of pregnancy, the woman may report a heavy menstrual flow. Miscarriage that occurs between the sixth and twelfth weeks of pregnancy causes moderate discomfort and blood loss. After the twelfth week, miscarriage is typified by more severe pain, similar to that of labor, because the fetus must be expelled. Diagnosis of the type of miscarriage is based on the signs and symptoms present (Table 23-6).

Symptoms of a threatened miscarriage (see Fig. 23-6, A) include spotting of blood but with the cervical os closed. Mild uterine cramping may be present.

Inevitable (see Fig. 23-6, B) and incomplete (see Fig. 23-6, C) miscarriages involve a moderate to heavy amount of bleeding with an open cervical os. Tissue may be present with the bleeding. Mild to severe uterine cramping may be present. An inevitable miscarriage is often accompanied by rupture of membranes (ROM) and cervical dilation; passage of the products of conception will occur. An incomplete miscarriage involves the expulsion of the fetus with retention of the placenta (Cunningham et al., 2005).

In a complete miscarriage (see Fig. 23-6, D), all fetal tissue is passed, the cervix is closed, and there may be slight bleeding. Mild uterine cramping may be present.

The term missed miscarriage (see Fig. 23-6, E) refers to a pregnancy in which the fetus has died but the products of conception are retained in utero for several weeks. It may be diagnosed by ultrasonic examination after the uterus stops increasing in size or even decreases in size. There may be no bleeding or cramping, and the cervical os remains closed.

Recurrent early (habitual) miscarriage is the loss of two or more previable pregnancies, though some providers still define recurrent miscarriage as the loss of three or more pregnancies before 20 weeks of gestation (Cunningham et al., 2005). Recurrent miscarriage is associated with the development of placental abruptions and hypertensive disorders (Sheiner, Levy, Katz, & Mazor, 2004).

Miscarriages can become septic, although this is not a common occurrence. Symptoms of a septic miscarriage include fever, abdominal tenderness, and vaginal bleeding, which may be slight to heavy and is malodorous.

Collaborative care. Whenever a woman with vaginal bleeding early in pregnancy seeks treatment, a thorough assessment should be performed (Box 23-6). Information to be obtained includes pain, bleeding, and date of last menstrual period (LMP) to determine approximate gestational age. Pain must be thoroughly assessed; type, location, duration, and precipitating and palliative factors are rated. The initial database should also include vital signs (a temperature higher than 38°C may indicate infection), previous pregnancies, previous pregnancy losses, quantity and nature of the vaginal bleeding, allergies, and emotional status. It is not uncommon for the woman and her family to be anxious and fearful about what may happen to her and to her pregnancy.

Laboratory evaluation of hCG levels, a placental hormone, is used in the diagnosis of pregnancy and pregnancy loss. Low levels of hCG are characteristic of miscarriage. hCG is produced by the syncytiotrophoblast, and the beta subunit of hCG (β-hCG) can be detected in maternal plasma and urine 7 to 9 days after ovulation if the woman is pregnant. In early pregnancy, the concentration of β-hCG should double every 2 days until about 60 to 70 days of gestation, with peak levels (100,000 milliinternational units/ml) at approximately 8 to 10 weeks of gestation (Cunningham et al., 2005). From 10 to 12 weeks of gestation, hCG levels begin to decrease, with a nadir at approximately 20 weeks of gestation (Cunningham et al., 2005). Before 8 weeks of gestation, if a miscarriage is suspected, two serum quantitative β-hCG levels are drawn 48 hours apart. If a normal pregnancy is present, the β-hCG level doubles within that time. Ultrasongraphy can then be used to determine the presence of a viable fetus within a gestational sac. With considerable or persistent blood loss, anemia is likely (hemoglobin level less than 11 g/dl). If infection is present, the white blood cell (WBC) count is greater than 12,000 cells/mm³.

The following nursing diagnoses are appropriate for the woman experiencing miscarriage:

- Anxiety or fear related to
  - unknown outcome and unfamiliarity with medical procedures
- Deficient fluid volume related to
  - excessive bleeding secondary to miscarriage
- Anticipatory grieving related to
  - unexpected pregnancy outcome
- Situational low self-esteem related to
  - inability to successfully carry a pregnancy to term gestation

Medical management. Medical management (see Table 23-6) depends on the classification and on signs and symptoms. Traditionally, threatened miscarriages have been managed with bed rest and supportive care. Though commonly prescribed for women with early vaginal bleeding, bed rest in pregnancy is controversial (Maloni, 2002). Follow-up treatment depends on whether the threatened miscarriage progresses to actual miscarriage or symptoms subside and the pregnancy remains intact. Dilation and curettage (D&C) is a surgical procedure in which the cervix is dilated and a curette is inserted to scrape the uterine walls and remove uterine contents. A D&C is commonly performed to treat inevitable and incomplete miscarriage. The nurse reinforces explanations, answers any questions or concerns, and prepares the woman for surgery.

Dilation and evacuation, performed after 16 weeks of gestation, consists of wide cervical dilation followed by instrumental removal of the uterine contents.

Before either surgical procedure is performed, a full history should be obtained and general and pelvic examinations should be performed. General preoperative and postoperative care is appropriate for the woman requiring surgical intervention for miscarriage. Anesthesia or anesthesia appropriate to the procedure are used.
### Table 23-6: Assessing Miscarriage and the Usual Management

<table>
<thead>
<tr>
<th>Type of Miscarriage</th>
<th>Amount of Bleeding</th>
<th>Uterine Passage of Tissue</th>
<th>Cramping</th>
<th>Cervical Dilation</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threatened</td>
<td>Slight, spotting</td>
<td>Mild</td>
<td>No</td>
<td>No</td>
<td>Bed rest (controversial), sedation, and avoidance of stress, sexual stimulation, and orgasm usually recommended. Acetaminophen-based analgesics may be given. Further treatment depends on woman's response to treatment.</td>
</tr>
<tr>
<td>Inevitable</td>
<td>Moderate</td>
<td>Mild to severe</td>
<td>No</td>
<td>Yes</td>
<td>Bed rest if no pain, fever or bleeding. If pain, rupture of membranes (ROM), bleeding, pain or fever then prompt termination of pregnancy is accomplished, usually by dilation and curettage.</td>
</tr>
<tr>
<td>Incomplete</td>
<td>Heavy, profuse</td>
<td>Severe</td>
<td>Yes</td>
<td>Yes, with tissue in cervix</td>
<td>May or may not require additional cervical dilation before curettage. Suction curettage may be done.</td>
</tr>
<tr>
<td>Complete</td>
<td>Slight</td>
<td>Mild</td>
<td>Yes</td>
<td>No</td>
<td>No further intervention may be needed if uterine contractions are adequate to prevent hemorrhage and there is no infection. Suction or curettage may be performed to assure no retained fetal or maternal tissue.</td>
</tr>
<tr>
<td>Missed</td>
<td>None, spotting</td>
<td>None</td>
<td>No</td>
<td>No</td>
<td>If spontaneous evacuation of the uterus does not occur within 1 month, pregnancy is terminated by method appropriate to duration of pregnancy. Blood clotting factors are monitored until uterus is empty. Disseminated intravascular coagulation (DIC) and incoagulability of blood with uncontrolled hemorrhage may develop in cases of fetal death after the twelfth week, if products of conception are retained for longer than 5 weeks. May be treated with dilation and curettage or 800 micrograms of misoprostol.</td>
</tr>
<tr>
<td>Septic</td>
<td>Varies, usually malodorous</td>
<td>Varies</td>
<td>Varies</td>
<td>Yes, usually</td>
<td>Immediate termination of pregnancy by method appropriate to duration of pregnancy. Cervical culture and sensitivity studies are done, and broad-spectrum antibiotic therapy (e.g., ampicillin) is started. Treatment for septic shock is initiated if necessary.</td>
</tr>
<tr>
<td>Recurrent (generally defined as 3 or more consecutive abortions)</td>
<td>Varies</td>
<td>Varies</td>
<td>Yes</td>
<td>Yes, usually</td>
<td>Varies, depends on type. Prophylactic cerclage may be done if premature cervical dilation is the cause. Tests of value include: parental cytogenetic analysis and lupus anticoagulant and anticardiolipin antibodies assays.</td>
</tr>
</tbody>
</table>

Three or four doses of ergonovine, 0.2 mg orally or intravenously, may be given to contract the uterus. If the products of conception are not passed in entirety, the woman may be prepared for manual or surgical evacuation of the uterus. IV oxytocin may also be administered into the amniotic sac or by vaginal route. For late incomplete or inevitable miscarriages and missed miscarriages (16 to 20 weeks of gestation), prostaglandins may be administered to induce or augment labor and cause the products of conception to be expelled. IV oxytocin may also be used. The woman will usually be discharged home postoperatively after a suction D&C when her vital signs are stable, vaginal bleeding is minimal, and she has recovered from anesthesia. Discharge teaching should emphasize the need for rest. If significant blood loss has occurred, iron supplementation may be ordered. Teaching should also include information about normal physical findings, such as cramping, type and amount of bleeding, resumption of sexual activity, and family planning. Frequently, the woman and her family want to know when she may become pregnant again. Although this is dependent on the cause of the pregnancy loss, most health care providers suggest waiting approximately 2 to 3 months before becoming pregnant again, dependent upon the provider and the woman. This time allowance facilitates physical and emotional healing. Follow-up care should assess the woman’s physical and emotional recovery (Armstrong, 2004). Referrals to local support groups should be provided as needed. For excessive bleeding after the miscarriage, ergot products such as carbofuran are administered to the amniotic fluid to help process her grief. She may be asked questions, seek advice, and receive information to help process her grief.

For late incomplete or inevitable miscarriages and missed miscarriages (16 to 20 weeks of gestation), prostaglandins may be administered to the amniotic sac or by vaginal suppository to induce or augment labor and cause the products of conception to be expelled. IV oxytocin may also be used.

Nursing care is similar to the care for any woman whose labor is being induced (see Chapter 24). Special care may be needed for management of side effects of prostaglandins, such as nausea, vomiting, and diarrhea. If the products of conception are not passed in entirety, the woman may be prepared for manual or surgical evacuation of the uterus.

After evacuation of the uterus, 10 to 20 units of oxytocin in 1000 ml of IV fluids may be given to prevent hemorrhage. Transfusion therapy may be required for shock or anemia. The woman who is Rh negative and is not immunized is given an IM injection of Rh(D) immune globulin within 72 hours of the miscarriage (Cunningham et al., 2005).

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Assessment of Bleeding in Pregnancy

<table>
<thead>
<tr>
<th>INITIAL DATABASE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chief complaint</td>
</tr>
<tr>
<td>Vital signs</td>
</tr>
<tr>
<td>Gravity, parity</td>
</tr>
<tr>
<td>Date of last menstrual period and estimated date of birth</td>
</tr>
<tr>
<td>Pregnancy history (previous and current)</td>
</tr>
<tr>
<td>Allergies</td>
</tr>
<tr>
<td>Nausea and vomiting</td>
</tr>
<tr>
<td>Pain (onset, quality, precipitating event, and location)</td>
</tr>
<tr>
<td>Bleeding or coagulation problems</td>
</tr>
<tr>
<td>Level of consciousness</td>
</tr>
<tr>
<td>Emotional status</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EARLY PREGNANCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confirmation of pregnancy</td>
</tr>
<tr>
<td>Bleeding (bright or dark, intermittent or continuous)</td>
</tr>
<tr>
<td>Pain (type, intensity, persistence)</td>
</tr>
<tr>
<td>Vaginal discharge</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LATE PREGNANCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated date of birth</td>
</tr>
<tr>
<td>Vaginal discharge</td>
</tr>
<tr>
<td>Amniotic membrane status</td>
</tr>
<tr>
<td>Uterine activity</td>
</tr>
<tr>
<td>Abdominal pain</td>
</tr>
<tr>
<td>Fetal status and viability</td>
</tr>
</tbody>
</table>

Immediate nursing care focuses on physiologic stabilization. Typical orders to be followed would be initiation of an IV line, request for blood testing of hemoglobin and hematocrit, blood type and Rh, and indirect Coombs’ screen. An ultrasound examination is performed for diagnostic confirmation.

Nursing care is similar to the care for any woman whose labor is being induced (see Chapter 24). Special care may be needed for management of side effects of prostaglandins, such as nausea, vomiting, and diarrhea. If the products of conception are not passed in entirety, the woman may be prepared for manual or surgical evacuation of the uterus.

After evacuation of the uterus, 10 to 20 units of oxytocin in 1000 ml of IV fluids may be given to prevent hemorrhage. Transfusion therapy may be required for shock or anemia. The woman who is Rh negative and is not immunized is given an IM injection of Rh(D) immune globulin within 72 hours of the miscarriage (Cunningham et al., 2005).
Recurrent premature dilation of the cervix (incompetent cervix)

Passive and painless dilation of the cervical os without labor or contractions of the uterus (incompetent cervix) may occur in the second trimester or early in the third trimester of pregnancy. As a result miscarriage or preterm birth may result. This definition assumes an “all-or-nothing” role for the cervix; it is either “competent” or “incompetent.” Current researchers contend that cervical competence is variable and exists as a continuum that is determined in part by cervical length. Other related causative factors include composition of the cervical tissue and the individual circumstances associated with the pregnancy in terms of maternal stress and lifestyle. Iams (2004) refers to this condition as abnormal or reduced cervical competence, whereas Freda (1999) refers to this condition as abnormal or premature dilation of the cervix.

Etiology. Etiologic factors include a history of previous cervical trauma such as lacerations during childbirth, excessive cervical dilation for curettage or biopsy, or ingestion of diethylstilbestrol (DES) by the woman’s mother while pregnant with the woman. Other causes are a congenitally short cervix and cervical or uterine anomalies. Reduced cervical competence is a clinical diagnosis, based on history. Short labors and recurring loss of pregnancy at progressively earlier gestational ages are characteristics of reduced cervical competence. Diagnostic criteria for ultrasound are (1) a short cervix (i.e., less than 20 mm in length) and (2) funneling of the internal os of 30% to 40% of the cervix (Iams, 2004). Effacement of the internal cervical os is sometimes referred to as cervical funneling.

Collaborative care. The nurse assesses the woman’s feelings about her pregnancy and her understanding of reduced cervical competence. It is also important to evaluate the woman’s support systems. Because the diagnosis of reduced cervical competence is usually not made until the woman has lost one or two pregnancies, she may feel guilty or responsible for this impending loss. It is therefore important to assess for previous reactions to stresses and appropriateness of coping responses. The woman needs the support of her health care provider, as well as that of her family.

Medical management. Conservative management consists of bed rest, hydration, progesterone, antiinflammatory drugs, and antibiotics (Iams, 2004). A cervical cerclage may be performed. During pregnancy, a Shirodkar or a McDonald procedure may be done. With the Shirodkar, maternal fascia lata is threaded submucosally in the cervix anteriorly and posteriorly and tied (Cunningham et al., 2005). In the McDonald cerclage, nonabsorbable ribbon (Mersilene) may be placed around the cervix beneath the mucosa to constrict the internal os of the cervix (Fig. 23-7) (Cunningham et al., 2005). Prophylactic cerclage is placed at 11 to 15 weeks of gestation, after which the woman is told to refrain from intercourse, prolonged (i.e., more than 90 minutes) standing, and heavy lifting (Iams, 2004). She is
monitored during the course of her pregnancy with ultrasound scans to assess for cervical shortening and funneling. The cerclage is electively removed (usually an office or a clinic procedure) when the woman reaches 37 weeks of gestation, or it may be left in place and a cesarean birth performed. If removed, cerclage placement must be repeated with each successive pregnancy. Approximately 80% to 90% of pregnancies treated with cerclage result in live, viable births (Iams, 2004). Recent data suggest that prophylactic cerclage may have no advantage over surveillance by ultrasound (Iams, 2004).

A woman whose reduced cervical competence is diagnosed during the current pregnancy may undergo emergency cerclage placement. Risks of the procedure include premature rupture of membranes (PROM), preterm labor, and chorioamnionitis. Because of these risks, and because bed rest and tocolytic therapy can be used to prolong the pregnancy, cerclage is rarely performed after 25 weeks of gestation (Iams, 2004).

**Nursing care.** If a cerclage is performed, the nurse monitors the woman postoperatively for contractions, ROM, and signs of infection. Discharge teaching focuses on continued monitoring of these aspects at home. Home uterine monitoring may be indicated with follow-up from a home health agency. The nurse assesses the woman’s feelings about her pregnancy and her understanding of reduced cervical competence.

**Home care.** The woman must understand the importance of activity restriction at home and the need for close observation and supervision. Instruction includes the rationale for bed rest or activity restriction and to report signs of preterm labor, ROM, and infection. Tocolytics may be given to prevent uterine contractions and further dilation of the cervix. The woman must be instructed regarding the importance of taking oral tocolytic medication as prescribed, the expected response, and possible side effects. If home uterine monitoring is implemented, the woman is taught how to apply a uterine contraction monitor and transmit the monitor tracing by telephone to the monitoring center. Nurses at the monitoring center assess the tracing for contractions, answer questions, provide emotional support and education, and report information to the woman’s physician or nurse-midwife. The woman should know the signs that would warrant immediate transfer to the hospital, including strong contractions less than 5 minutes apart, ROM, severe perineal pressure, and an urge to push. If management is unsuccessful and the fetus is born prematurely, appropriate anticipatory guidance and support are necessary.

**Ectopic pregnancy**

**Incidence and etiology.** An ectopic pregnancy is one in which the fertilized ovum is implanted outside the uterine cavity (Fig. 23-8). It accounts for 2% of all pregnancies in the United States (Dialani & Levine, 2004; Sepilian & Wood, 2004). Approximately 95% to 97% of ectopic pregnancies occur in the uterine (fallopian) tube, with most located in the ampulla (75% to 80%) or largest portion of the tube (Dialani & Levine, 2004). Other sites include the abdominal cavity (3% to 4%) and ovary (0.5%) (Gilbert & Harmon, 2003).

Ectopic pregnancy is the leading pregnancy-related cause of first-trimester maternal deaths and is responsible for 9% of all maternal deaths (Dialani & Levine, 2004; Sepilian & Wood, 2004). Ectopic pregnancy is a leading cause of infertility. Women who have been treated surgically for ectopic pregnancy have a subsequent intrauterine pregnancy rate of 25% to 70%; however, up to 28% of those pregnancies are ectopic. Women treated with methotrexate have an intrauterine pregnancy rate of 64%, and the risk of a recurrent ectopic pregnancy is approximately 11% (Sepilian & Wood, 2004).

The reported incidence of ectopic pregnancy is rising. Some of the increase is due to improved diagnostic techniques, resulting in the identification of more cases. Risk factors for ectopic pregnancy include an increased incidence of sexually transmitted infections (STIs), more effective treatment of pelvic inflammatory disease (PID), increased numbers of tubal sterilizations, use of an intrauterine contraceptive device, douching, and exposure to utero, surgical reversal of tubal sterilizations, in vitro fertilization, and previous history of ectopic pregnancy (Dialani & Levine, 2004; Sepilian & Wood, 2004). Ectopic pregnancy is classified according to site of implantation (e.g., tubal, ovarian). The uterus is the only organ capable of containing and sustaining a term pregnancy. However, 5% to 25% of abdominal pregnancies, with birth by laparotomy, may result in a living infant (Fig. 23-9). The risk of deformity is as high as 40% (Gilbert & Harmon, 2003).

**Clinical manifestations.** Abnormal vaginal bleeding, adnexal fullness, and pain are the classic symptoms of ectopic pregnancy (Dialani & Levine, 2004). Women generally have abdominal pain (97%) as the primary presenting symptom at approximately 5 to 6 weeks of gestation (Dialani & Levine, 2004). The tenderness can progress from a dull
For examination to be expected for a normal pregnancy, the woman is asked to undergo screening for ectopic pregnancy. Laboratory spotting or bleeding, and a positive pregnancy test should this condition. Any woman with abdominal pain, vaginal order that shares many signs and symptoms. Miscarriage, ruptured corpus luteum cyst, torsion of the ovary, and urinary tract infection is having a high index of suspicion for isometropic irritation caused by blood in the peritoneal cavity. The woman may exhibit signs of shock related to the amount of bleeding in the abdominal cavity and not necessarily related to obvious vaginal bleeding. An ecchymotic blueness around the umbilicus (Cullen sign), indicating hematoperitoneum, may develop in an undiagnosed, ruptured intraabdominal ectopic pregnancy. In addition, with abdominal palpation and bimanual examination there is abdominal and adnexal tenderness (Cunningham et al., 2005; Dialani & Levine, 2004). Other presenting symptoms include dizziness and fainting and pregnancy symptoms.

**Collaborative care.** The differential diagnosis of ectopic pregnancy involves consideration of numerous disorders that share many signs and symptoms. Miscarriage, ruptured corpus luteum cyst, appendicitis, salpingitis, ovarian cysts, torsion of the ovary, and urinary tract infection must be considered (Table 23-7). The key to early detection of ectopic pregnancy is having a high index of suspicion for this condition. Any woman with abdominal pain, vaginal spotting or bleeding, and a positive pregnancy test should undergo screening for ectopic pregnancy. Laboratory screening includes determination of serum progesterone and \( \beta \)-hCG levels. If either of these values is lower than would be expected for a normal pregnancy, the woman is asked to return within 48 hours for serial measurements. For exam-ple, an intrauterine sac should be visible by ultrasound at 5 to 6 menstrual weeks or 28 days following ovulation or when the \( \beta \)-hCG is 1500 to 2000 milliinternational units/ml (Chan & Johnson, 2004; Cunningham et al., 2005; Dialani & Levine, 2004). As early as 1 week after missed menses the woman will have vaginal sonography to confirm intrauterine or tubal pregnancy. The gestational sac, diagnostic for an ectopic pregnancy, is visible from 4.5–5 weeks of gestation with transvaginal ultrasound and has become the imaging method of choice (Chan & Johnson, 2006; Cunningham et al., 2005).

**Hospital care.** The woman should be assessed for the presence of active bleeding, associated with tubal rupture. If internal bleeding is present, the woman may report vertigo, shoulder pain, hypotension, and tachycardia. A vagi-nal examination should be performed only once, and then with great caution. Approximately half of patients with a tubal pregnancy have a palpable mass on examination. It is possible to rupture the mass during a bimanual examination, so care should be taken (Simpon, 2002).

Removal of the ectopic pregnancy by salpingostomy is possible before rupture when the pregnancy is less than 2 cm in length and located in the ampulla (Cunningham et al., 2005). Residual tissue may be dissolved with a dose of methotrexate postoperatively. Methotrexate is an antimetabolite and folic acid antagonist that destroys rapidly dividing cells.

Advanced ectopic abdominal pregnancy requires laparotomy as soon as the woman has been stabilized for sur-gery. If the placenta of a second- or third-trimester abdomi-nal pregnancy is attached to a vital organ, such as the liver, separation and removal are usually not attempted because of the risk of hemorrhage. The cord is cut flush with the pla-centa and the abdomen is closed, leaving the placenta in place. Degeneration and absorption of the placenta usually occur without complication, although infection and intes-tinal obstruction may occur. Methotrexate may be given to dissolve the residual tissue (Cunningham et al., 2005; Gilbert & Harmon, 2003).

If surgery is planned, general preoperative and postop-erative care is appropriate for the woman with an ectopic pregnancy. Before surgery, vital signs (pulse, respirations, and BP) are assessed every 15 minutes or as needed, according to severity of the bleeding and the woman’s condition. Pre-operative laboratory tests include determination of blood type and Rh factor, complete blood cell count, and serum quantitative \( \beta \)-hCG assay. Ultrasonography is used to confirm an extrauterine pregnancy. Blood replacement may be necessary. Postoperatively, the nurse verifies the woman’s Rh and antibody status and administers Rh(D) immune glob-ulin if appropriate. The woman should be encouraged to verbalize her feelings related to the loss. Referral to community resources may be appropriate.

Hemodynamically stable women with ectopic pregnancies are eligible for methotrexate therapy if the mass is un-ruptured and measures less than 3.5 cm in diameter by
Ultrasound (Sepilian & Wood, 2004). Methotrexate therapy avoids surgery and is a safe, effective, and cost-effective way of managing many cases of tubal pregnancy. Management is almost always accomplished on an outpatient basis. The woman is informed of how the medication works, possible side effects, whom to call if she has concerns or if problems develop, and the importance of follow-up care. After receiving the single methotrexate injection, the woman will need to return at least weekly for follow-up laboratory studies and for an average of 2 to 8 weeks or until the HCG level is less than 15 milliinternational units/mL (Kumtepe & Kadanali, 2004; Sepilian & Wood, 2004). A repeat dose of methotrexate may be necessary if HCG titers do not drop to 25% by day 7, with approximately 20% of women requiring a second injection. Multiple dose regimens may also be given. During that time, the woman is instructed to put nothing in her vagina (e.g., no tampons or douches, no intercourse) and to avoid sun exposure because the drug may cause photosensitivity (Weiner & Buhimschi, 2004).

### TABLE 23-7
Differential Diagnosis of Ectopic Pregnancy

<table>
<thead>
<tr>
<th>ECTOPIC PREGNANCY</th>
<th>APPENDICITIS</th>
<th>SALPINGITIS</th>
<th>RUPTURED OVARIAN CYST</th>
<th>MISSCARRIAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>Unilateral cramps and tenderness before rupture, may be colicky after rupture</td>
<td>Epigastric, periumbilical, then right lower quadrant pain, tenderness localizing at McBurney’s point, rebound tenderness</td>
<td>Usually in both lower quadrants with or without rebound</td>
<td>Unilateral, becoming general with progressive bleeding, dull cramping</td>
</tr>
<tr>
<td>Nausea and vomiting</td>
<td>Occasionally before, frequently after rupture</td>
<td>Infrequent, very rarely</td>
<td>Rare</td>
<td>Almost never</td>
</tr>
<tr>
<td>Menses</td>
<td>Some alteration, missed period, spotting</td>
<td>Hypermenorrhea, metrorrhagia, or both</td>
<td>Period delayed, then bleeding, often with pain Not over 37.2°C, pulse normal unless blood loss marked, then rapid</td>
<td>Amenorrhea then spotting, then brisk bleeding To 37°C. Signs of shock related to obvious bleeding</td>
</tr>
<tr>
<td>Temperature, pulse, and blood pressure</td>
<td>37.2°C-37.8°C, pulse variable, normal before and rapid after rupture, I&amp;II after rupture</td>
<td>37.2°C-37.8°C, pulse rapid</td>
<td>37.2°C-40°C, pulse elevated in proportion to fever</td>
<td>37.2°C-37.8°C, pulse variable, normal before and rapid after rupture, ↓BP after rupture</td>
</tr>
<tr>
<td>Pelvic examination</td>
<td>Unilateral tenderness, especially on movement of cervix, crepitant mass on one side or in cul-de-sac; dark red or brown vaginal discharge</td>
<td>No masses, rectal tenderness high on right side; no vaginal discharge</td>
<td>Bilateral tenderness on movement of cervix; purulent discharge</td>
<td>Tenderness over affected ovary, no masses</td>
</tr>
<tr>
<td>Pelvic examination</td>
<td></td>
<td></td>
<td></td>
<td>Cervix open or closed, uterus slightly enlarged, irregularly softened, tender with infection, vaginal bleeding</td>
</tr>
<tr>
<td>Laboratory findings</td>
<td>WBC to 15,000/mm³; Pregnancy test result is positive Ultrasound to rule out pregnancy after 6 weeks</td>
<td>WBC 10,000-18,000/mm³ (rarely normal); Pregnancy test result is negative</td>
<td>WBC 15,000-30,000/mm³; Pregnancy test result is negative</td>
<td>WBC normal to 10,000/mm³; Pregnancy test result is negative unless also pregnant Ultrasound will show ovarian cyst</td>
</tr>
</tbody>
</table>

The woman on methotrexate therapy who consumes alcohol and takes vitamins containing folic acid (such as prenatal vitamins) increases her risk of experiencing side effects of the drug or exacerbating the ectopic rupture.

Home care. Future fertility should be discussed. Any woman who has been diagnosed with an ectopic pregnancy should be told to contact her health care provider as soon as she suspects that she might be pregnant, because of the increased risk for recurrent ectopic pregnancy. These women may need referral to grief or infertility support groups. In addition to the loss of the current pregnancy, they are faced with the possibility of future pregnancy losses or infertility.

Hydatidiform mole

Gestational trophoblastic disease (GTD) includes disorders that arise from the placental trophoblast. It includes hydatidiform mole and gestational trophoblastic neoplasia (GTN). A hydatidiform mole may be further categorized as a complete or partial mole. GTN refers to persistent trophoblastic tissue that is presumed to be malignant (Berman Di Saia, & Tewari, 2004; Gilbert & Harmon, 2003). Metastatic trophoblastic neoplasia is commonly staged as low risk, intermediate risk and high risk GTN (ACOG, 2004b). Once almost invariably fatal, because of early diagnosis and treatment, GTN is the most curable gynecologic malignancy (Berman, Di Saia, & Tewari, 2004).

Incidence and etiology. Hydatidiform mole occurs in 1 in 1200 pregnancies in the United States and Europe, but a higher incidence has been reported in Asian countries (Berman, DiSaia, & Tewari, 2004). The cause is unknown, although it may be related to an ovular defect or a nutritional deficiency. Women at higher risk for hydatidiform mole formation are those women in their early teens or over 40 years of age and women from the Far East and tropics. The risk of developing a second mole is 1% to 2%.

Types. The complete mole results from fertilization of an egg whose nucleus has been lost or inactivated (Fig. 23-10, A). The nucleus of a sperm (23,X) duplicates itself (resulting in the diploid number 46,XX) because the ovum has no genetic material or the material is inactive. The mole resembles a bunch of white grapes (Fig. 23-10, B). The hydropic (fluid-filled) vesicles grow rapidly, causing the uterus to be larger than expected for the duration of the pregnancy. Usually the complete mole contains no fetus, placenta, amniotic membranes, or fluid. Maternal blood has no placenta to receive it; therefore, hemorrhage into the uterine cavity and vaginal bleeding occur. In approximately 20% of women with a complete mole, choriocarcinoma or GTN occurs (Cunningham et al., 2005).

A partial mole occurs as a result of two sperm fertilizing an apparently normal ovum. Partial moles often have embryonic or fetal parts and an amniotic sac. Congenital anomalies are usually present (Cunningham et al., 2005). The potential for malignant transformation is 5% to 10% (Cunningham et al., 2005).

**Clinical manifestations.** In the early stages, the clinical manifestations of a complete hydatidiform mole cannot be distinguished from those of normal pregnancy. Later, vaginal bleeding occurs in almost 95% of cases. The vaginal discharge may be dark brown (resembling prune juice) or bright red and either scant or profuse. It may continue for only a few days or intermittently for weeks. Early in pregnancy the uterus in approximately 50% of affected women is significantly larger than expected from menstrual dates. Anemia from blood loss, excessive nausea and vomiting (hyperemesis gravidarum), and abdominal cramps caused by uterine distention are relatively common findings. Preeclampsia occurs in approximately 12% of cases, usually between 9 and 12 weeks of gestation, but any symptoms of preeclampsia before 20 weeks of gestation may suggest hydatidiform mole. Hyperthyroidism and pulmonary embolization of trophoblastic elements occur infrequently but are serious complications of hydatidiform mole. Partial
Late Pregnancy Bleeding

Late pregnancy bleeding disorders include placenta previa, premature separation of placenta (abruption placentae), and cord insertion and variations in the insertion of the cord and placenta. Expedient assessment for and diagnosis of the cause of bleeding is essential to reduce risk of maternal and perinatal morbidity and mortality (Fig. 23-11).

Placenta Previa

In placenta previa, the placenta is implanted in the lower uterine segment near or over the internal cervical os. Historically, the degree to which the internal cervical os is covered by the placenta has been used to classify four types of placenta previa: total, partial, marginal and low-lying (Fig. 23-12). With a total previa the internal os is entirely covered by the placenta. Partial placenta previa implies incomplete coverage of the internal os. Marginal placenta previa indicates that only an edge of the placenta extends to the margin of the internal os. The term low-lying placenta has been used when the placenta is implanted in the lower uterine segment but does not reach the os (Cunningham et al., 2005). Clark (2004) suggests that this classification has become obsolete due in part to better ultrasonic diagnosis of placenta previa. Clark offers a more descriptive classification that includes placenta previa (in the third trimester, the placenta covers the internal os) and marginal placenta previa (the distance of the placenta is 2 to 3 cm from the internal os and does not cover it). When the exact relationship of the os to the placenta has not been determined or in the case of apparent placenta previa in the second trimester, the term low-lying placenta is used (Clark, 2004).

Incidence and etiology. The incidence of placenta previa is approximately 0.5% of births (Clark, 2004). The most important risk factors are previous placenta previa, previous cesarean birth, and suction curettage for miscarriage or induced abortion, possibly related to endometrial scarring (Ananth, Demissie, Smulian, & Vintzileos, 2001b). The risk also increases with multiple gestation (because of the larger placental area), closely spaced pregnancies, advanced maternal age (older than 35 years), African or Asian ethnicity, male fetal sex, smoking, cocaine use, multiparity, and tobacco use (Clark, 2004; Berman, DiSaia, & Tewari, 2004).

Clinical manifestations. Approximately 70% of women with placenta previa have painless vaginal bleeding; 20% have vaginal bleeding associated with uterine activity. Previa should be suspected whenever vaginal bleeding occurs after 20 weeks of gestation. This bleeding, bright red in color, is associated with the stretching and thinning of the lower uterine segment that occurs during the third trimester. Placental attachment is gradually disrupted, and bleeding occurs when the uterus is not able to adequately contract and stop blood flow from open vessels (Benedetti, 2002). The initial bleeding is usually a small amount and stops as clots form; however, it can recur at any time (Table 23-5).

Vital signs may be normal, even with heavy blood loss, because a pregnant woman can lose up to 40% of blood volume without showing signs of shock. Clinical presentation and decreasing urinary output may be better indicators of acute blood loss than vital signs alone. The FHR is reassuring unless there is a major detachment of the placenta (Gilbert & Harmon, 2003). Abdominal examination usually reveals a soft, relaxed, nontender uterus with normal tone. If the fetus is lying
closer to the os, the placenta may be partially covered by the uterus (Fig. 23-13). 

Collaborative care. Nursing assessment during prenatal visits should include observation for signs of molar pregnancy during the first 24 weeks. If hydatidiform mole is suspected, ultrasonography and serial β-hCG immunoassays are used to confirm the diagnosis. The sonographic pattern of a molar pregnancy is characterized by a diffuse “snowstorm” pattern. The β-hCG titer will remain high or rises above normal peak after the time at which it normally drops (70 to 100 days) (Cunningham et al., 2005). Although most moles abort spontaneously (around 16 weeks of gestation), suction evacuation (curettage) offers a safe, rapid, and effective method of evacuation of hydatidiform mole if necessary (Cunningham et al., 2005; Gilbert & Harmon, 2003). Induction of labor with oxytocic agents or prostaglandins is not recommended because of the increased risk of embolization of trophoblastic tissue. Administration of Rh(D) immune globulin to women who are Rh negative is necessary to prevent isoimmunization.

The nurse helps the woman and her family cope with the pregnancy loss and recognize that the pregnancy was abnormal. In addition, the woman and her family are encouraged to verbalize their feelings, and information is provided about support groups or counseling resources as needed. Follow-up management includes frequent physical and pelvic examinations and weekly measurements of β-hCG level until the level drops to normal and remains normal for 2 consecutive weeks. Then β-hCG measurements are taken for every 1 to 2 months for a total of 1 year. A rising β-hCG titer will remain high or rises above normal peak after the time at which it normally drops (70 to 100 days) (Cunningham et al., 2005).

Moles cause few of these symptoms and may be mistaken for an incomplete or missed miscarriage. Lastly, women may pass vesicles from the uterus which are frequently avascular edematous villi (Berman, Di Saia, & Tewari, 2004).

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longitudinally, the fundal height is usually greater than expected for gestational age because the low placenta hinders descent of the presenting fetal part. Leopold’s maneuvers may reveal a fetus in an oblique or breech position or lying transverse because of the abnormal site of placental implantation.

Maternal and fetal outcomes. The maternal morbidity rate is approximately 5% and the mortality rate is less than 1% with placenta previa (Clark, 2004). Complications associated with placenta previa include premature ROM, preterm labor and birth, surgery-related trauma to structures adjacent to the uterus, anesthesia complications, blood transfusion reactions, overinflation of fluids, abnormal placental attachments, (e.g., placenta accreta), postpartum hemorrhage, thrombophlebitis, anemia, and infection (Ananth et al., 2001b; Crane, Van den Hof, Dodds, Armson, & Liston, 2000).

The greatest risk of fetal death is caused by preterm birth. Other fetal risks include malpresentation and congenital anomalies (Clark, 2004; Gilbert & Harmon, 2003). Infants who are small for gestational age or have IUGR have been associated with placenta previa. This association may be related to poor placental exchange or hypovolemia resulting from maternal blood loss and maternal anemia (Clark, 2004).
Fig. 23-12  Types of placenta previa after onset of labor. A, Complete, or total. B, Incomplete, or partial. C, Marginal, or low lying.

TABLE 23-8
Summary of Findings: Abruptio Placentae and Placenta Previa

<table>
<thead>
<tr>
<th></th>
<th>ABRUPTIO PLACENTAE</th>
<th>PLACENTA PREVIA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GRADE 1 MILD</td>
<td>GRADE 2 MODERATE</td>
</tr>
<tr>
<td></td>
<td>SEPARATION (10% TO 20%)</td>
<td>SEPARATION (20% TO 50%)</td>
</tr>
<tr>
<td>Bleeding, external, vaginal</td>
<td>Minimal</td>
<td>Absent to moderate</td>
</tr>
<tr>
<td>Total amount of blood loss</td>
<td>&lt;500 ml</td>
<td>1000-1500 ml</td>
</tr>
<tr>
<td>Color of blood</td>
<td>Dark red Rare; none</td>
<td>Dark red Mild shock</td>
</tr>
<tr>
<td>Shock</td>
<td>Coagulopathy</td>
<td>Uterine toxicity</td>
</tr>
<tr>
<td>Rare, none</td>
<td>Normal</td>
<td>Occasional DIC Increased, may be localized to one region or diffuse over uterus, uterus fails to relax between contractions</td>
</tr>
<tr>
<td>Tenderness (pain)</td>
<td>Usually absent</td>
<td>Agonizing, unrelenting uterine pain</td>
</tr>
<tr>
<td>ULTRASONOGRAPHIC FINDINGS</td>
<td>Location of placenta</td>
<td>Normal, upper uterine segment</td>
</tr>
<tr>
<td></td>
<td>Station of presenting part</td>
<td>Variable to engaged</td>
</tr>
<tr>
<td></td>
<td>Fetal position</td>
<td>Normal, upper uterine segment</td>
</tr>
<tr>
<td></td>
<td>Gestational or chronic hypertension</td>
<td>Usual distribution*</td>
</tr>
<tr>
<td></td>
<td>Fetal effects</td>
<td>Normal fetal heart rate pattern</td>
</tr>
</tbody>
</table>

DIC, Disseminated intravascular coagulation.

*Usual distribution refers to the usual variations of incidence seen when there is no concurrent problem.
CARE MANAGEMENT

Assessment and Nursing Diagnoses
A woman with third-trimester vaginal bleeding requires immediate evaluation. Necessary data from the history include gravidity, parity, estimated date of birth (EDB), general status, bleeding (i.e., quantity, quality), precipitating event, and associated pain, vital signs, and fetal status (see Box 23-6). Laboratory studies include a complete blood count, determination of blood type and Rh status, coagulation profile, and possible type and crossmatch.

Placenta previa is diagnosed using transabdominal ultrasound. Transvaginal ultrasounds follow positive transabdominal scans with fewer false-positive results (Cunningham et al., 2005). If ultrasonographic scanning reveals a normally implanted placenta, an examination may be performed to rule out local causes of bleeding (e.g., cervicitis, polyps, or carcinoma of the cervix), and a coagulation profile is obtained to rule out other causes of bleeding. Management of placenta previa depends on the gestational age and condition of the fetus and the amount of bleeding present. It includes expectant management and cesarean birth. Expectant management (observation and bed rest) is implemented if the fetus is not mature. Women may be placed in the hospital on bed rest with bathroom privileges and limited activity in the labor and birth unit, where she and the fetus can be closely monitored. If expectant management is to be implemented, a vaginal speculum examination is postponed until fetal viability is reached (preferably after 34 weeks of gestation). If a pelvic examination is needed before that time, anticipate the possibility that an immediate cesarean birth may be required. The woman is taken to a delivery room or an operating room set up where she and the fetus can be closely monitored. If expectant management is to be implemented, a vaginal speculum examination is postponed until fetal viability is reached (preferably after 34 weeks of gestation). If a pelvic examination is needed before that time, anticipate the possibility that an immediate cesarean birth may be required. The woman is taken to a delivery room or an operating room set up where she and the fetus can be closely monitored.

Potential nursing diagnoses for the woman experiencing placenta previa include the following:

- Decreased cardiac output related to
  - excessive blood loss secondary to placenta previa
- Deficient fluid volume related to
  - excessive blood loss secondary to placenta previa
- Ineffective peripheral tissue perfusion related to
  - hypovolemia and shunting of blood to central circulation
- Anxiety or fear related to
  - maternal condition and pregnancy outcome
- Anticipatory grieving related to
  - actual or perceived threat to self, pregnancy, or infant

Expected Outcomes of Care
Expected outcomes for the woman experiencing placenta previa may include that the woman will do the following:

- Verbalize understanding of her condition and its management
- Identify and use available support systems
- Demonstrate compliance with prescribed activity limitations
- Develop no complications related to bleeding
- Give birth to a healthy term infant

Plan of Care and Interventions

Active management
Once placenta previa has been diagnosed, a management plan is developed based on gestational age, amount of bleeding, and fetal condition. If the woman is at term (longer than or equal to 37 weeks of gestation) and in labor or bleeding persistently, immediate cesarean birth is almost always indicated. In women with placental “migration” or movement of the placenta in relationship to the internal os of a vaginal birth may be attempted (Cunningham et al., 2005). Vaginal birth may also be indicated for preivable gestations or births involving intrauterine fetal demise (Benedetti, 2002).

Cesarean birth is necessary for the large majority of women with a placenta previa. The nurse continuously assesses maternal and fetal status while preparing the woman for surgery. Maternal vital signs are assessed frequently for decreasing BP, increasing pulse rate, changes in LOC, and oliguria. Fetal assessment is maintained by continuous electronic fetal monitoring to assess for signs of hypoxia.

Blood loss may not cease with the birth of the infant. The large vascular channels in the lower uterine segment may continue to bleed because of the area’s diminished muscle content. The natural mechanism to control bleeding—the interlacing muscle bundles contracting around open vessels (the “living ligature,” characteristic of the upper part of the uterus)—is absent in the lower part of the uterus. Postpartum hemorrhage may therefore occur even if the fundus is contracted firmly.

Emotional support for the woman and her family is extremely important. The actively bleeding patient is concerned not only for her own well-being but for the well-being of her fetus. All procedures should be explained, and a support person should be present. The woman should be encouraged to express her concerns and feelings. If the woman and her support person or family desire spiritual support, the nurse can notify the hospital chaplain service or provide information about other supportive resources.

Expectant management. If the woman is at less than 36 weeks of gestation, she is not in labor, and the bleeding is mild or has stopped, expectant management (i.e., rest and close observation) is generally the treatment of choice to give the fetus time to mature in utero. The woman may remain in the hospital on bed rest with bathroom privileges and limited activity (up in a wheelchair for short periods, approximately 1 hour daily). Bleeding is assessed by checking the amount of bleeding on perineal pads, bed pads, and linens. Weighing pads, although not frequently used, is one way to more accurately assess blood loss: 1 g equals 1 ml of blood.
Ultrasoundogic examinations may be done every 2 to 3 weeks. Fetal surveillance may include an NST or BPP once or twice weekly. Serial laboratory values are evaluated for decreasing hemoglobin and hematocrit levels and changes in coagulation values. Venous access with an IV infusion or heparin lock may be placed in case blood or blood component therapy is needed. Antepartum steroids (betamethasone) may be ordered to promote fetal lung maturity if gestation is less than 34 weeks. No vaginal or rectal examinations are performed, and the woman is placed on "pelvic rest" (nothing in the vagina). If sonographic findings indicate that the placental edge is located within 2 cm of the internal os then a cesarean birth is necessary (Bhide & Thilaganathan, 2004). Once she reaches 37 weeks of gestation and fetal lung maturity is documented, cesarean birth can be scheduled.

The woman with placenta previa should always be considered a potential emergency because massive blood loss with resulting hypovolemic shock can occur quickly if bleeding resumes. Placenta previa in a preterm gestation may be an indication for transfer to a tertiary perinatal center because prolonged labor or delivery may result in fetal death. Placenta previa in a preterm gestation may be an indication for transfer to a tertiary perinatal center because of resulting hypovolemic shock can occur quickly if bleeding resumes. Placenta previa in a preterm gestation may be an indication for transfer to a tertiary perinatal center because of resulting hypovolemic shock can occur quickly if bleeding resumes. Placenta previa in a preterm gestation may be an indication for transfer to a tertiary perinatal center because a neonatal intensive care unit may be necessary for care of the preterm neonate.

Home care: Criteria for home care management, currently an uncommon practice, vary among primary perinatal providers and are usually determined on a case-by-case basis. To be considered for home care referral, the woman must be in stable condition with no evidence of active bleeding and must have transportation to be able to return to the hospital immediately if active bleeding resumes. She must have close supervision by family or friends in the home. The woman should be taught how to assess fetal and uterine activity and bleeding and told to avoid intercourse, douching, and enemas. She should limit her activities according to the advice of her physician and be advised to keep all appointments for fetal testing, laboratory assessments, and perinatal care. Visits by a perinatal home care nurse may be arranged. If hospitalization or home care with activity restriction is prolonged, the woman may have concerns about her work- or family-related responsibilities or may become bored with inactivity. She should be encouraged to participate in her own care and decisions about care as much as possible. Provision of diversionary activities or encouragement to participate in activities she enjoys and can do during bed rest is needed (see suggestions for activities in the Self-Care box on p. 727). Participation in support group made up of other women on bed rest while hospitalized, or online if at home may be a helpful coping mechanism (Maloni & Kurl, 2006).

Evaluation
The expected outcomes of care are used to evaluate the care for the woman with placenta previa (Plan of Care).

**NURSING DIAGNOSIS** Decreased cardiac output related to bleeding secondary to placenta previa

**Expected Outcome** Woman will exhibit signs of increased blood volume and restoration of cardiac output (i.e., normal pulse and blood pressure; normal heart and breath sounds; normal skin color, tone, and turgor; normal capillary refill).

**Nursing Interventions/Rationales**
- Palpate uterus for tenderness and tone; assess bleeding rate, amount, color; CBC values, and coagulation profile to determine severity of situation. (Do not perform vaginal examination, because it may stimulate further bleeding.)
- Establish baseline data for cardiac output (tachycardia, decreased movement, loss of reactivity on NST to identify and treat changes in fetal status).
- Obtain BPP per physician order to assess for signs of chronic asphyxia.
- Maintain maternal side-lying position to prevent compression of aorta and vena cava.

**NURSING DIAGNOSIS** Risk for infection related to anemia and bleeding secondary to placenta previa

**Expected Outcome** Woman will show no signs of intrauterine infection.

**Nursing Interventions/Rationales**
- Monitor vital signs for elevated temperature, pulse, and blood pressure; monitor laboratory results for elevated WBC count, differential shift; check for uterine tenderness and malodorous vaginal discharge to detect early signs of infection resulting from exposure of placental tissue.
- Provide or teach perineal hygiene to decrease the risk of ascending infection.
Premature separation of placenta

Premature separation of the placenta, or *abruptio placentae*, is the detachment of part or all of the placenta from its implantation site (Fig. 23-13). Separation occurs in the area of the decidua basalis after 20 weeks of gestation and before the birth of the infant.

**Incidence and etiology.** Premature separation of the placenta is a serious complication that accounts for significant maternal and fetal morbidity and mortality rates. Approximately 1 in 200 of all pregnancies is complicated by abruptio placentae (Cunningham et al., 2005).

Maternal hypertension is probably the most consistently identified risk factor for abruption (Benedetti, 2002). Cocaine is also a risk factor, believed to be the result of severe hypertension (Andres & Day, 2000). Blunt external abdominal trauma, most often the result of motor vehicle accidents (MVAs) or maternal battering, is an increasingly significant cause of placental abruption (Benedetti, 2002; Clark, 2004). Other risk factors include cigarette smoking, previous abruption (5% to 17%), cocaine use (10%), and preterm rupture of membranes (Clark, 2004; Cunningham et al., 2005). Abruption is more likely to occur in twin gestations (Ananth et al., 2001a). Women who have had two previous abruptions have a recurrence risk of 25% in the next pregnancy (Clark, 2004).

**Classification.** The most common classification of placental abruption is according to type and severity. This classification system is summarized in Table 23-8.

**Clinical manifestations.** The separation may be partial or complete, or only the margin of the placenta may be involved. Bleeding from the placental site may dissect (separate) the membranes from the decidua basalis and flow out through the vagina (70% to 80%), it may remain concealed (retroplacental hemorrhage) (10% to 20%), or it may do both (see Fig. 23-13) (Benedetti, 2002). Clinical symptoms vary with degree of separation (see Table 23-8). Classic symptoms of abruptio placentae include vaginal bleeding, abdominal pain, and uterine tenderness and contractions (Clark, 2004; Cunningham et al., 2005). Although abdominal pain and uterine tenderness are characteristic of abruption, either finding may be absent in the presence of a silent abruption (Clark, 2004). Bleeding may result in maternal hypovolemia (i.e., shock, oliguria, and anuria) and coagulopathy. Mild to severe uterine hypertonicity is present. Pain is mild to severe and localized over one region of the uterus or diffuse over the uterus with a “boardlike” abdomen.

Extensive myometrial bleeding damages the uterine muscle. If blood accumulates between the separated placenta and the uterine wall, it may produce a *Couvelaire uterus*. The uterus appears purplish and copper colored and is echymotic, and contractility is lost. Shock may occur and is out of proportion to blood loss. The APT test result is positive, hemoglobin and hematocrit levels drop, and coagulation factor levels drop. With the APT test (blood in the amniotic fluid), vaginal blood is mixed with sodium hydroxide. Maternal blood turns brown while fetal blood remains red. A Kleihauer-Betke (KB) test may be ordered to determine the presence of fetal-to-maternal bleeding (transplacental hemorrhage), although there appears to be no value to this test in the general workup of patients with abruption (Clark, 2004).

**Maternal and fetal outcomes.** Maternal mortality rate approaches 1% for women with an abruptio placentae (Clark, 2004). This condition remains a leading cause of maternal death. The mother’s prognosis depends on the extent of placental detachment, overall blood loss, degree of DIC, and time between placental detachment and birth. Maternal complications are associated with the abruption or its treatment. Hemorrhage, hypovolemic shock, hypofibrinogenemia, and thrombocytopenia are associated with severe abruption. Renal failure and pituitary necrosis may result from ischemia. In rare cases, women who are Rh negative can become sensitized if fetal-to-maternal hemorrhage occurs and the fetal blood type is Rh positive.

Perinatal mortality rates range from 10% to 12% (Cunningham et al., 2005). Death occurs as a result of fetal hypoxia, preterm birth, and SGA status. Risks for neurologic defects are increased (Cunningham et al., 2005). Fetal complications include congenital anomalies (Clark, 2004).
Collaborative care. Abruptio placentae should be highly suspected in the woman with a sudden onset of intense, usually localized, uterine pain, with or without vaginal bleeding. Initial assessment is much the same as for placenta previa. Physical examination usually reveals abdominal pain, uterine tenderness, and contractions. The fundal height should be measured over time, because an increasing fundal height indicates concealed bleeding. Approximately 60% of live fetuses exhibit nonreassuring signs, such as loss of variability and late decelerations, on the electronic fetal heart monitor; uterine hyperstimulation and increased resting tone may also be noted on the monitor tracing (Benedetti, 2002). Many women demonstrate coagulopathy, as evidenced by abnormal clotting studies (fibrinogen, platelet count, PTT, fibrin split products). Sonographic examination is used to rule out placenta previa; however, it is not always diagnostic for abruption (Cunningham et al., 2005). A retroplacental mass may be detected with ultrasonographic examination, but negative findings do not rule out a life-threatening abruption (Clark, 2004).

Nursing diagnoses and expected outcomes of care are similar to those described for placenta previa. Treatment depends on the severity of blood loss and fetal maturity and status. Women with abruptio placentae are not usually managed out of the hospital because the placenta can separate further at any time and immediate intervention may be necessary. However, if the abruption is mild and the fetus is less than 36 weeks of gestation and not in distress, expectant management may be implemented. The woman is hospitalized and observed closely for signs of bleeding and labor. The fetal status is also monitored with intermittent FHR monitoring and NSTs or BPPs until fetal maturity is determined or until the woman’s condition deteriorates and immediate birth is indicated. Use of corticosteroids to accelerate fetal lung maturity is appropriately included in the plan of care for expectant management (Cunningham et al., 2005). Women who are Rh negative may be given Rho(D) immune globulin if fetal-to-maternal hemorrhage occurs.

If the mother is hemodynamically stable, a vaginal birth may be attempted if the fetus is alive and in no acute distress or if the fetus is dead. In the presence of fetal compromise, severe hemorrhage, coagulopathy, poor labor progress, or increasing uterine resting tone, a cesarean birth is performed. At least one large-bore (16 to 18-gauge) IV line should be started. Maternal vital signs are monitored frequently to observe for signs of declining hemodynamic status, such as increasing pulse rate and decreasing BP. Serial laboratory studies include hematocrit or hemoglobin determinations and clotting studies. Continuous electronic fetal monitoring is mandatory. An indwelling Foley catheter is inserted for continuous assessment of urine output, an excellent indirect measure of maternal organ perfusion (Benedetti, 2002).

Blood and fluid volume replacement will most likely be ordered, with a goal of maintaining the urine output at 30 ml/hr or greater and the hematocrit at 30% or greater. If this goal is not reached despite vigorous attempts at replacement, hemodynamic monitoring may be necessary (Benedetti, 2002). Fresh frozen plasma or cryoprecipitate may be given to maintain the fibrinogen level at a minimum of 100 to 150 mg/dl.

Vaginal birth is possible and is especially desirable in cases of fetal demise; however, cesarean birth is common because of fetal or maternal distress. Nursing care of patients experiencing moderate to severe abruption is demanding because it requires close monitoring of the maternal and fetal condition. All procedures should be explained to the woman and her family. Emotional support is also extremely important. If actively bleeding, the woman is concerned not only for her own well-being but also for the well-being of her fetus.

Cord insertion and placental variations

Velamentous insertion of the cord is a rare placental anomaly associated with placenta previa and multiple gestation. The cord vessels begin to branch at the membranes and then course onto the placenta (Fig. 23-14, A). ROM or traction on the cord may tear one or more of the fetal vessels. As a result the fetus may quickly bleed to death.
Battledore (marginal) (Fig. 23-14, B) insertion of the cord in- creases the risk of fetal hemorrhage, especially after marginal separation of the placenta.

Rarely, the placenta may be divided into two or more sepa- rate lobes, resulting in inappropriata placenta (Fig. 23-14, C).

Each lobe has a distinct circulation. The vessels collect at the periphery, and the main trunks unite eventually to form the vessels of the cord. Blood vessels joining the lobes may be supported only by the fetal membranes and are therefore in danger of tearing during labor, birth, or expulsion of the pla- centa. During expulsion of the placenta, one or more of the separate lobes may remain attached to the decidua basalis, preventing uterine contraction and increasing the risk of postpartum hemorrhage.

Normal Clotting

Normally, there is a delicate balance (homeostasis) between the opposing hemostatic and fibrinolytic systems. The hemostatic system is involved in the lifesaving process. This system stops the flow of blood from injured vessels, in part through the formation of insoluble fibrin, which acts as a he- mostatic platelet plug. The coagulation process involves an interaction of the coagulation factors in which each factor sequentially activates the factor next in line, the "cascade ef- fect" sequence. The fibrinolytic system is the process through which the fibrin is split into fibrinolytic degradation prod- ucts and circulation is restored.

Clotting Problems

A history of abnormal bleeding, inheritance of unusual bleeding tendencies, or a report of significant aberrations of lab- oratory findings indicate a bleeding or clotting problem. For the pregnant woman, bleeding disorders are suspected if the woman has gestational hypertension, HELLP syndrome, re- tained dead fetus syndrome, amniotic fluid embolism, sep- sis, or hemorrhage. Determination of hemostasis is made by testing the usual mechanisms for the control of bleeding, the function of platelets, and the necessary clotting factors. Most clotting disorders are more a concern in the immediate post- partum period. Recognition in the antepartum period may de- crease hemorrhagic problems (see Chapter 25).

Disseminated intravascular coagulation (DIC)

Disseminated intravascular coagulation (DIC) or con- sumptive coagulopathy is a pathologic form of clotting that is diffuse and consumes large amounts of clotting factors, causing widespread external bleeding, internal bleeding, or both and clotting (Cunningham et al., 2005). DIC is most of- ten triggered by the release of large amounts of tissue throm- boplastin. This occurs in abruptio placentae, retained dead fetus, and amniotic fluid embolism syndrome. Severe preeclampsia, HELLP syndrome, and gram-negative sepsis are examples of conditions that can trigger DIC because of wide- spread damage to vascular integrity (Cunningham et al., 2005; Kilpatrick & Laro, 2004). DIC is an overactivation of the clot- ting cascade and the fibrinolytic system, resulting in deple- tion of platelets and clotting factors. This results in the for- mation of multiple fibrin clots throughout the body's vasculature, even in the microcirculation. Blood cells are de- stroyed as they pass through these fibrin choked vessels. Thus DIC results in a clinical picture of clotting, bleeding, and is- chemia (Cunningham et al., 2005; Labelle & Kitchens, 2005). DIC is always a secondary diagnosis. Clinical manifestations and laboratory test results are summarized in Box 23-7.

Collaborative care

Medical management during pregnancy includes cor- recting the underlying cause and replacement of essential fac- tors and fluid volume. (See Chapter 25 for further discussion.) The nurse caring for the pregnant woman at risk for DIC must be aware of risk factors. Careful and thorough assessment is required, with particular attention to the signs of bleeding (e.g., petechiae, “oozing” from venous access sites or any break in the skin, and hematuria). Because renal failure is one con- sequence of DIC, urinary output is carefully monitored (min- imum of 30 ml/h) using an indwelling Foley catheter. Vital signs are assessed frequently. Supportive measures include keeping the pregnant woman in a side-lying tilt to maximize

**Box 23-7**

**Antepartal Clinical Manifestations and Laboratory Screening Results for Pregnant Patients with Disseminated Intravascular Coagulation**

- Possible Physical Examination Findings
  - Spontaneous bleeding from gums, nose
  - Oozing, excessive bleeding from venipuncture site, intravenous access site, or site of insertion of urinary catheter
  - Petechiae, for example on the arm where blood pressure cuff was placed
  - Other signs of bruising
  - Hematuria
  - Gastrointestinal bleeding
  - Tachycardia
  - Diaphoresis

- Laboratory Coagulation Screening Test Results
  - Platelets-decreased
  - Fibrogenogen-decreased
  - Factor V (proaccelerin)–decreased
  - Factor VIII (antihemolytic factor)–decreased
  - Prothrombin time–prolonged
  - Partial thromboplastin time–prolonged
  - Fibrin degradation products–increased
  - D-dimer test (specific fibrin degradation frag- ment)–increased
  - Red blood smear–fragmented red blood cells

Sources: Cunningham et al., 2005; Kilpatrick & Laro, 2004; Labelle & Kitchens, 2006.
blood flow to the uterus. Oxygen may be administered through a tight-fitting rebreathing mask at 8 to 10 L/min, or per hospital protocol or physician order. Blood and blood products must be administered safely. Fetal assessments are done to monitor fetal well-being (Labelle & Kitchens, 2005; Lurie, Feinstein, & Mamet, 2000). DIC usually is “cured” with the birth and as coagulation abnormalities resolve.

INFECTIONS ACQUIRED DURING PREGNANCY

Sexually Transmitted Infections

Sexually transmitted infections (STIs) in pregnancy are responsible for significant morbidity rates. Some consequences of maternal infection, such as infertility and sterility, last a lifetime. Psychosocial sequelae may include altered interpersonal relationships and lowered self-esteem. Congenitally acquired infection may affect the length and quality of a child’s life. Chapter 5 discusses the diagnosis and management of STIs, and Chapter 27 discusses neonatal effects and management. This discussion focuses only on the effects of several common STIs on pregnancy and the fetus (Table 23-9). Effects on pregnancy and the fetus also vary according to whether the infection has been treated at the time of labor and birth.

Collaborative care

The most common STIs in women are chlamydia, human papillomavirus, gonorrhea, herpes simplex virus type 2, syphilis, and human immunodeficiency virus (HIV) infection (Centers for Disease Control and Prevention [CDC], 2002). Factors that influence the development and management of STIs during pregnancy include previous history of STI or pelvic inflammatory disease (PID), number of current sexual partners, frequency of intercourse, and anticipated sexual activity during pregnancy. Lifestyle choices also may affect STIs in the perinatal period. Risk factors include use of IV drugs or having a partner who uses IV drugs. Other lifestyle factors that increase susceptibility to STIs (through suppressive effects on the immune system) include smoking, alcohol use, inadequate or poor nutrition, and high levels of fatigue or personal stress (Gibbs, Sweet, & Duff, 2004).

Physical examination and laboratory studies to determine the presence of STIs in the pregnant woman are the same as those done in nonpregnant women (see Chapter 5). Treatment of specific STIs may be different for the pregnant woman and may even be different at different stages of pregnancy. Table 23-9 describes the maternal, fetal, and neonatal effects. Table 23-10 describes treatment during pregnancy of common STIs. Infected women need instruction regarding how to take prescribed medications, information on whether their partner(s) also need to be evaluated and treated, and a review of preventive measures to avoid reinfection.

TORCH Infections

TORCH infections can affect a pregnant woman and her fetus. Toxoplasmosis, other infections (e.g., hepatitis), rubella virus, cytomegalovirus, and herpes simplex virus, known collectively as TORCH infections, are a group of organisms capable of crossing the placenta and adversely affecting the development of the fetus. Generally, all TORCH infections produce influenza-like symptoms in the woman, but fetal

<table>
<thead>
<tr>
<th>TABLE 23-9</th>
<th>Pregnancy and Fetal Effects of Common Sexually Transmitted Infections</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFECTION</td>
<td>PREGNANCY EFFECTS</td>
</tr>
<tr>
<td>Chlamydia</td>
<td>Premature rupture of membranes</td>
</tr>
<tr>
<td></td>
<td>Preterm birth</td>
</tr>
<tr>
<td>Gonorrhea</td>
<td>Intraamniotic infection</td>
</tr>
<tr>
<td></td>
<td>Preterm labor</td>
</tr>
<tr>
<td></td>
<td>Premature rupture of membranes</td>
</tr>
<tr>
<td></td>
<td>Postpartum endometritis</td>
</tr>
<tr>
<td>Group B streptococcus</td>
<td>Preterm labor</td>
</tr>
<tr>
<td></td>
<td>Premature rupture of membranes</td>
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<tr>
<td></td>
<td>Chorioamnionitis</td>
</tr>
<tr>
<td></td>
<td>Postpartum sepsis</td>
</tr>
<tr>
<td>Herpes simplex</td>
<td>Urinary tract infections</td>
</tr>
<tr>
<td>Human papillomavirus (HPV)</td>
<td>Rare— infection</td>
</tr>
<tr>
<td>Syphilis</td>
<td>Dystocia from large lesions</td>
</tr>
<tr>
<td></td>
<td>Excessive bleeding from lesions after birth trauma</td>
</tr>
<tr>
<td></td>
<td>Preterm labor</td>
</tr>
<tr>
<td></td>
<td>Miscarriage</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>SEXUALLY TRANSMITTED INFECTION</th>
<th>TREATMENT</th>
<th>NURSING CONSIDERATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlamydia</td>
<td>Erythromycin 500 mg PO four times a day × 7 days; or amoxicillin 500 mg PO three times a day × 7 days</td>
<td>Instruct woman to take after meals and with 8 oz water; instruct partner to be tested and treated if needed.</td>
</tr>
<tr>
<td></td>
<td>Acyclovir is used in pregnancy only if the potential benefit outweighs the potential risk to the fetus; treat symptoms. Analgesics and topical anesthetics may be ordered for severe discomfort.</td>
<td>Instruct woman in comfort measures: keep lesions clean and dry; use compresses on lesions (cold milk, colloidal oatmeal) every 2 to 4 hr, sitz baths; woman should abstain from intercourse while lesions are present; if woman has active lesions at time of labor, a cesarean birth will usually be performed to prevent perinatal transmission.</td>
</tr>
<tr>
<td>Herpes</td>
<td>Ceftriaxone 125 mg IM × one dose or Cefixime, 400 mg po X one dose or Spectinomycin, 2 grams IM as single dose plus treatment for chlamydial as listed above</td>
<td>Pregnant women should be screened at 36-37 weeks of gestation; if positive or status unknown at time of labor, the woman is treated.</td>
</tr>
<tr>
<td></td>
<td>Ceftriaxone 125 mg IM × one dose or Cefixime, 400 mg po X one dose or Spectinomycin, 2 grams IM as single dose plus treatment for chlamydial as listed above</td>
<td>Screening should be at first prenatal visit, with rescreening in third trimester for high risk patients; treatment is supportive—bed rest, high protein, low-fat diet, increased fluid intake; the woman should avoid medications that are metabolized in the liver.</td>
</tr>
<tr>
<td>Gonorrhea</td>
<td>Ceftriaxone 125 mg IM × one dose or Cefixime, 400 mg po X one dose or Spectinomycin, 2 grams IM as single dose plus treatment for chlamydial as listed above</td>
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</tr>
<tr>
<td>Group B streptococcus</td>
<td>Penicillin G 5 million units IV initial dose followed by 2.5 million units IV q4 hours during labor or ampicillin 2 grams IV initial dose followed by 1 gram IV q4 hours</td>
<td>Treatment cures maternal infection and prevents congenital syphilis 98% of the time; routine screening during pregnancy should be at the first prenatal visit and in the third trimester in women at high risk; partners should be tested and treated if needed.</td>
</tr>
<tr>
<td></td>
<td>Benzathine penicillin G 2.4 million units IM once; if syphilis of more than one year duration then 2.4 million units IM (one dose per week X 3 weeks)</td>
<td>Treatment cures maternal infection and prevents congenital syphilis 98% of the time; routine screening during pregnancy should be at the first prenatal visit and in the third trimester in women at high risk; partners should be tested and treated if needed.</td>
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</tr>
<tr>
<td>Hepatitis B</td>
<td>For exposure, hepatitis B immune globulin 0.06 mg/kg IM; repeat in 1 mo, followed by hepatitis B vaccine series</td>
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</tr>
<tr>
<td>Human papillomavirus</td>
<td>Trichloracetic acid (TCA) or bichloracetic acid (BCA) 80% to 90% applied topically to warts one to three times a week; Xylocaine jelly applied for burning sensations; cryotherapy with liquid nitrogen in second and third trimesters; CO2 laser ablation therapy</td>
<td>Trichloracetic acid (TCA) or bichloracetic acid (BCA) 80% to 90% applied topically to warts one to three times a week; Xylocaine jelly applied for burning sensations; cryotherapy with liquid nitrogen in second and third trimesters; CO2 laser ablation therapy</td>
</tr>
<tr>
<td>Syphilis</td>
<td>Benzathine penicillin G 2.4 million units IM once; if syphilis of more than one year duration then 2.4 million units IM (one dose per week X 3 weeks)</td>
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</tr>
<tr>
<td>Trichomoniasis</td>
<td>Metronidazole 2 grams PO once</td>
<td>Inform partners to be treated; women should avoid alcohol and vinegar products to avoid nausea and vomiting, intestinal cramping, and headaches; not recommended during lactation; stop breastfeeding, treat; resume in 48 hours after last dose.</td>
</tr>
<tr>
<td>Candidiasis</td>
<td>Over-the-counter topical agents; butoconazole, clotrimazole, miconazole, or terconazole; use for 7 days</td>
<td>Women may use breast pump and discard milk to prevent interruption of milk supply. May be used during lactation.</td>
</tr>
<tr>
<td>Bacterial vaginosis</td>
<td>Metronidazole 250 mg PO three times a day × 7 days</td>
<td>See Trichomonas; infection may increase risk of preterm labor; women are usually asymptomatic.</td>
</tr>
</tbody>
</table>

*IM, intramuscularly; IV, intravenously; PO, by mouth*
and neonatal effects are more serious. TORCH infections and their maternal and fetal effects are described in Table 23-11. Neonatal effects are discussed in Chapter 27.

### SURGICAL EMERGENCIES DURING PREGNANCY

The incidence of surgery requiring anesthesia during pregnancy ranges from 0.2% to 2.2%, affecting an estimated 50,000 to 75,000 pregnant women each year (Kuczkowski, 2004; Ludmir & Stubblefield, 2002). The need for abdominal surgery occurs as frequently among pregnant women as among nonpregnant women of comparable age. However, pregnancy may make diagnosis more difficult. An enlarged uterus and displaced internal organs may make abdominal palpation more difficult, alter the position of an affected organ, or change the usual signs and symptoms associated with a particular disorder. Common conditions necessitating abdominal surgery during pregnancy include cerclage, ovarian cystectomy, and appendectomy (Kuczkowski, 2004). Fetal concerns include teratogenic effects secondary to the anesthetic drugs used, intrauterine fetal death, and premature labor (Kuczkowski, 2004). Regional anesthesia is preferred, with intensive fetal and maternal monitoring. After 24 weeks...

### TABLE 23-11

<table>
<thead>
<tr>
<th>INFECTION</th>
<th>MATERNAL EFFECTS</th>
<th>FETAL EFFECTS</th>
<th>COUNSELING: PREVENTION, IDENTIFICATION, AND MANAGEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TORCH</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toxoplasmosis (protozoa)</td>
<td>Acute infection similar to influenza, lymphadenopathy</td>
<td>With maternal acute infection, parasitemia</td>
<td>Use good handwashing technique</td>
</tr>
<tr>
<td></td>
<td>Woman immune after first episode (except in immunocompromised patients)</td>
<td>Less likely to occur with maternal chronic infection</td>
<td>Avoid eating raw meat and exposure to litter used by infected cats; if cats in house, have toxoplasma titer checked</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Miscarriage likely with acute infection early in pregnancy</td>
<td>If litter is rising during early pregnancy, abortion may be considered an option</td>
</tr>
<tr>
<td><strong>OTHER INFECTIONS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis A (infectious hepatitis) (virus)</td>
<td>Miscarriage, cause of liver failure during pregnancy</td>
<td>Exposure during first trimester, fetal anomalies, fetal or neonatal hepatitis, preterm birth, intrauterine fetal death</td>
<td>Usually spread by droplet or hand contact especially by culinary workers; gammaglobulin can be given as prophylaxis for hepatitis A</td>
</tr>
<tr>
<td></td>
<td>Fever, malaise, nausea, and abdominal discomfort</td>
<td>Infection occurs during birth</td>
<td>Generally passed by contaminated needles, syringes, or blood transfusions; also can be transmitted orally or by coitus (but incubation period is longer); hepatitis B immune globulin can be given prophylactically after exposure</td>
</tr>
<tr>
<td>Hepatitis B (serum hepatitis) (virus)</td>
<td>May be transmitted sexually, symptoms variable—fever, rash, arthralgia, depressed appetite, dyspepsia, abdominal pain, generalized aching, malaise, weakness, jaundice, tender and enlarged liver</td>
<td>Maternal vaccination during pregnancy should present no risk for fetus (however, data are not available)</td>
<td>Hepatitis B vaccine recommended for populations at risk</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Populations at risk are women from Asia, Pacific islands, Indochina, Haiti, South Africa, Alaska (women of Eskimo descent); other women at risk include health care providers, users of intravenous drugs, those sexually active with multiple partners or single partner with multiple risks</td>
</tr>
</tbody>
</table>
of gestation lateral displacement of the uterus facilitates uteroplacental perfusion (Kaczkowski, 2004).

Appendicitis

Appendicitis occurs in approximately 1 in 2000 pregnancies. This condition occurs with approximately the same frequency during each trimester of pregnancy and the postpartum period (Ludmir & Stubblefield, 2002). The diagnosis of appendicitis is often delayed because the usual signs and symptoms mimic some normal changes of pregnancy such as nausea and vomiting and increased WBC count (Cunningham et al., 2005). As pregnancy progresses, the appendix is pushed upward and to the right of its usual anatomic location (see Fig. 8-13). Because of these changes, rupture of the appendix and the subsequent development of peritonitis occur two to three times more often in pregnant women than in nonpregnant women.

The woman with appendicitis most commonly has right lower quadrant abdominal pain, nausea and vomiting, and loss of appetite. Approximately half of these affected women have muscle guarding. Moving the uterus tends to increase the pain. Temperature may be normal or mildly increased (to 38.3°C). Because of the physiologic increase in WBCs that occurs in pregnancy, elevated WBC counts are not clear indicators of appendicitis (Mourad, Elliott, Erickson, & Lisboa, 2000). Significant increases associated

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</tr>
</thead>
<tbody>
<tr>
<td>Rubella (3-day, German measles) (virus)</td>
<td>Rash, fever, mild symptoms; suboccipital lymph nodes may be swollen; some photophobia</td>
<td>Incidence of congenital anomalies—first month 50%, second month 25%, third month 10%, fourth month 4%. Exposure during first 2 months—malformations of heart, eyes, ears, or brain, abnormal dermatoglyphics</td>
<td>Vaccination of pregnant women contraindicated; pregnancy should be prevented for 1 month after vaccination; pregnant women nonreactive to hemagglutinin-inhibition antigen can be safely vaccinated after birth</td>
</tr>
<tr>
<td>Cytomegalovirus (CMV) (a herpes virus)</td>
<td>Respiratory or sexually transmitted asymptomatic illness or mononucleosis-like syndrome; may have cervical discharge</td>
<td>Fetal death or severe, generalized disease—hemolytic anemia and jaundice, hydrocephaly or microcephaly, pneumonia, hepatosplenomegaly, deafness</td>
<td>Virus may be reactivated and cause disease in utero or during birth in subsequent pregnancies; fetal infection may occur during passage through infected birth canal; disease is commonly progressive through infancy and childhood</td>
</tr>
<tr>
<td>Herpes genitalis (herpes simplex virus, type 2 [HSV-2])</td>
<td>Primary infection with painful blisters, rash, fever, malaise, nausea, headache; pregnancy risks include miscarriage, preterm labor, stillbirths</td>
<td>Transplacental infection is rare; congenital effects include skin lesions and scarring, intrauterine growth restriction, mental retardation, microcephaly</td>
<td>Risk of transmission is greatest during vaginal birth if woman has active lesion; Azacylovir not recommended in pregnancy; treat symptomatically (see Table 23-10)</td>
</tr>
</tbody>
</table>

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with appendicitis must be monitored either by rising levels on serial samples or by an increasing left shift.

The diagnosis of appendicitis requires a high level of suspicion because the typical signs and symptoms are similar to those found in many other conditions, including pyelonephritis, round ligament pain, placental abruption, torsion of an ovarian cyst, cholecystitis, and preterm labor (Ludmir & Stubblefield, 2003) (see Table 23-7).

Appendectomy before rupture usually does not require either antibiotic or tocolytic therapy. If surgery is delayed until after rupture, multiple antibiotics are ordered. Rupture is likely to result in preterm labor, necessitating the use of tocolytic agents.

**Intestinal Obstructions**
The second most common nonobstetric abdominal emergency in pregnancy is intestinal obstruction. Any woman with a laparotomy scar is more likely to have an intestinal obstruction (adynamic ileus) during pregnancy. Adhesions as a result of previous surgery or PID, an enlarging uterus, and displacement of the intestines are etiologic factors. Symptoms include constipation; persistent cramplike, abdominal tenderness or pain (continuous or colicky); and vomiting (Cunningham et al., 2005). Auscultatory “rushes” within the abdomen and “laddering” of the intestinal shadows on x-ray films aid in the diagnosis of intestinal obstruction. Immediate surgery is required for release of the obstruction. Pregnancy is rarely affected by the surgery, assuming the absence of complications such as peritonitis.

**Gynecologic Problems**
Pregnancy predisposes a woman to ovarian problems, especially during the first trimester. Ovarian cysts and twisting (torsion) of ovarian cysts or twisting of adnexal tissues may occur. Other problems include retained or enlarged cystic corpus luteum of pregnancy, and bacterial invasion of reproductive or other intraperitoneal organs. Serial ultrasonograms, MRIs, and transvaginal color Doppler are used to diagnose most ovarian abnormalities (Cunningham et al., 2005). Ovarian masses generally regress by 16 to 20 weeks of gestation but if not then elective surgery may be done to remove masses. Laparotomy or laparoscopy may be required to discriminate between ovarian problems and early ectopic pregnancy, appendicitis, or an infectious process.

**Collaborative Care**
The woman and her family are concerned about the effects of the procedure and medication on fetal well-being and the course of pregnancy. An important part of preoperative nursing care is encouraging the woman to express her fears, concerns, and questions. Initial assessment of the pregnant woman requiring surgery focuses on her presenting signs and symptoms. A thorough history is obtained, and a physical examination is performed. Laboratory testing includes, at a minimum, a complete blood count with differential and a urinalysis. FHR, fetal heart activity, and uterine activity should be monitored; constant vigilance is maintained for symptoms of impending obstetric complications. The extent of preoperative assessment is determined by the immediacy of surgical intervention and the specific condition that necessitates surgery.

Preoperative care for a pregnant woman differs from that for a nonpregnant woman in one significant aspect: the presence of at least one other person, the fetus. Continuous FHR and uterine contraction monitoring should be performed if the fetus is considered viable. Procedures such as preparation of the operative site and time of insertion of IV lines and urinary retention catheters vary with the physician and the facility. Solid foods and liquids are restricted before surgery. If the woman experiences a prolonged NPO status, IV fluids with dextrose should be given. To decrease the risk of vomiting and aspiration, special precautions are taken before anesthetic is administered (e.g., administering an antacid).

Intraoperatively, prenatal nurses may collaborate with the surgical staff to provide for the special needs of pregnant women undergoing surgery. To improve fetal oxygenation, the woman is positioned on the operating table with a lateral tilt to avoid maternal compression of the vena cava. Continuous fetal and uterine monitoring during the procedure is recommended because of the risk for preterm labor. Monitoring may be accomplished using sterile Aquasonic gel and a sterile sleeve for the transducer. During abdominal surgery, uterine contractions may be palpated manually.

In the immediate recovery period, general observations and care pertinent to postoperative recovery are initiated. Frequent assessments are carried out for several hours after surgery. Continuous fetal and uterine monitoring will likely be initiated or resumed because of the increased risk of preterm labor. Tocolysis may be necessary if preterm labor occurs (see Chapter 24).

Plans for the woman’s return home and for convalescent care should be completed as early as possible before discharge. Depending on her insurance coverage, nursing care may be provided through a home health agency. If not, the woman and other support persons must be taught necessary skills and procedures, such as wound care. Box 23-8 lists information that should be included in discharge teaching for the postoperative patient. The woman may also need referrals to various community agencies for evaluation of the home situation, child care, home health care, and financial or other assistance.

**TRAUMA DURING PREGNANCY**

Trauma is a common complication during pregnancy because the majority of pregnant women in the United States continue their usual activities. Therefore pregnant women are at the same risk as other women for vehicular crashes, falls, industrial mishaps, violence, and other injuries in the home and community. Treatment of pregnant trauma victims is complicated because trauma health care providers sel-
Trauma increases the incidence of miscarriage, preterm labor, abruptio placentae, and stillbirth (Cunningham et al., 2005). The effect of trauma on pregnancy is influenced by the length of gestation, type and severity of the trauma, and degree of disruption of uterine and fetal physiologic features. Fetal death as a result of trauma is more common than the occurrence of both maternal and fetal death. Careful evaluation of mother and fetus after all types of trauma is imperative. Special considerations for mother and fetus are necessary when trauma occurs during pregnancy because of the physiologic changes of pregnancy and the presence of the fetus.

**Etiology**

Blunt abdominal trauma is most commonly the result of motor vehicle accidents but also may be the result of battering or falls (Cunningham et al., 2005). Maternal and fetal mortality and morbidity associated with MVAs are directly correlated with whether the mother remains inside the vehicle or is ejected. Maternal death is usually the result of a head injury or intrabdominal hemorrhage (Van Hook, Gei, & Pacheco, 2004). Fetal death usually correlates with the severity of the maternal injury (Gomi & Foley, 2004; Van Hook, Gei, & Pacheco, 2004). Serious retroperitoneal hemorrhage after lower abdominal and pelvic trauma is reported more frequently during pregnancy. Serious maternal abdominal injuries are usually the result of splenic rupture or liver or renal injury.

**Clinical Manifestations**

When maternal survival of trauma occurs, fetal death is usually the result of abruptio placentae occurring within 48 hours of the accident (Van Hook, Gei, & Pacheco, 2004).

**NURSE ALERT** It is imperative that all pregnant victims be carefully evaluated for signs and symptoms of abruptio placentae after even minor blunt abdominal trauma. Signs and symptoms of abruptio placentae include uterine tenderness or pain, uterine irritability, uterine contractions, vaginal bleeding, leaking of amniotic fluid, and a change in FHR characteristics (e.g., change in baseline rate, loss of accelerations, presence of late decelerations).

Pelvic fracture may result from severe injury and may produce bladder trauma or retroperitoneal bleeding with the two-point displacement of pelvic bones that usually occurs. One point of displacement is commonly at the symphysis pubis, and the second point is posterior because of the structure of the pelvis. Careful evaluation for clinical signs of internal hemorrhage is indicated (Cunningham et al., 2005).

Direct fetal injury as a complication of trauma during pregnancy most often involves the fetal skull and brain (Gilbert & Harmon, 2003). Most commonly this injury accompanies maternal pelvic fracture in late gestation, after the fetal head becomes engaged. When the force of the impact is great enough to fracture the maternal pelvis, the fetus will often sustain a skull fracture. Evaluation for fetal skull fracture or intracranial hemorrhage is indicated.

Uterine rupture as a result of trauma is rare, occurring in only 0.6% of all reported cases of trauma during pregnancy. Uterine rupture depends on numerous factors, including gestational age, the intensity of the impact, and the presence of a predisposing factor such as a distended uterus caused by polyhydramnios or multiple gestation or the presence of a uterine scar resulting from previous uterine surgery. When uterine rupture occurs, the force responsible is usually a direct, high-energy blow. Fetal death is common with
Penetrating Abdominal Trauma

Bullet wounds are the most frequent cause of penetrating abdominal injury, followed by stab wounds. In the majority of cases of penetrating abdominal wounds, the woman survives, but the fetus does not (41% to 71%) (Gonik & Foley, 2004). The enlarged uterus may protect other maternal organs, but the fetus is particularly vulnerable (Cunningham et al., 2005). Numerous factors determine the extent and severity of maternal and fetal injury from a bullet wound, including size and velocity of the bullet, anatomic region penetrated, angle of entry, path of the bullet, organs damaged, gestational age, and exit wound. Once the bullet enters the body, it may ricochet several times as it encounters organs or bone, or it may sever a large blood vessel. Gunshot wounds require surgical exploration to determine the extent of injury and repair damage as needed. Stab wounds are limited by the length and width of the penetrating object and are usually confined to the pathway of the weapon. Maternal and fetal injury are less if the stab wound is located in the upper abdomen and if movement of the penetrating object is from above the head downward toward the abdomen rather than from the ground upward toward the lower abdomen. Stab wounds usually require surgical exploration to clean debris, determine extent of injury, and repair damage.

Thoracic Trauma

Thoracic trauma is reported to produce 25% of all trauma deaths (Van Hook, Gei, & Pacheco, 2004). Chest trauma may result from a variety of penetrating injuries which include tension pneumothorax or open pneumothorax, hemothorax, cardiac tamponade, flail chest, myocardial damage, diaphragmatic rupture, aortic rupture, and pulmonary contusion. Pulmonary contusion results from nearly 75% of blunt thoracic trauma and is a potentially life-threatening condition. Pulmonary contusion can be difficult to recognize, especially if flail chest also is present or if there is no evidence of thoracic injury. Pulmonary contusion should be suspected in cases of thoracic injury, especially after blunt acceleration or deceleration trauma, such as that occurring when a rapidly moving vehicle crashes into an immovable object.

Penetrating wounds into the chest can result in pneumothorax or hemothorax. This type of injury is usually caused by a vehicular crash that results in impalement by the steering column or a loose article in the vehicle that became a projectile with the force of impact. Stab wounds into the chest also may occur as a result of violence.

Collaborative Care

Immediate priorities for stabilization of the pregnant woman after trauma should be identical to those of the nonpregnant trauma patient (Cunningham et al., 2005). Survival of the fetus is dependent on maternal survival and stabilization. The perinatal nurse is often called on to function collaboratively with emergency department or trauma unit staff members in providing care for the pregnant trauma victim. Priorities of care for the pregnant woman after trauma must be to resuscitate the woman and stabilize her condition first and then consider fetal needs. Lateral displacement of the uterus may significantly improve maternal cardiac output and therefore fetal oxygenation (Cunningham et al., 2005). On admission after trauma, pregnant women are typed, crossmatched, and screened, with a urinalysis, coagulation panel, ultrasound examination, and assessment of FHR performed as appropriate. A KB test is done for women at greater than 12 weeks of gestation to ascertain fetal red blood cells (fetomotheral hemorrhage) in the maternal circulation regardless of the maternal blood type. Rho(D) immunoglobulin administration is indicated for Rh-negative women with fetomotheral bleeding, and tetanus toxoid is administered if indicated (Cunningham et al., 2005).

In cases of minor trauma, the woman is evaluated for vaginal bleeding, uterine irritability, abdominal tenderness, abdominal pain or cramps, and evidence of hypovolemia. A change in or absence of FHR or fetal activity, leakage of amniotic fluid, and presence of fetal cells in the maternal circulation are also included in the assessment.

In cases of major trauma, the systematic evaluation begins with a primary survey and the initial “ABCD/EFD” of resuscitation: establishment of an airway, ensuring adequate breathing, maintaining an adequate circulation, assessing for disability (alert, voice, pain, and unresponsive), examining the patient head to toe (Van Hook, Gei, & Pacheco, 2004) and assessing fetal status.

On admission after trauma, pregnant women are typed, crossmatched, and screened, with a urinalysis, coagulation panel, ultrasound examination, and assessment of FHR performed as appropriate. A KB test is done for women at greater than 12 weeks of gestation to ascertain fetal red blood cells (fetomotheral hemorrhage) in the maternal circulation regardless of the maternal blood type. Rho(D) immunoglobulin administration is indicated for Rh-negative women with fetomotheral bleeding, and tetanus toxoid is administered if indicated (Cunningham et al., 2005).

After immediate resuscitation and successful stabilization measures, a more detailed secondary survey of the mother and fetus should be accomplished. A complete physical assessment including all body systems is performed. The eval-
The greatest clinical concern after vehicular crashes is abruptio placentae, as up to 40% of these women will have an abruption (Van Hook, 2002). Assessments should focus on recognition of this complication, with careful evaluation of fetal monitor tracings, uterine tenderness, labor, or vaginal bleeding. Ultrasound examination may be performed to determine gestational age, viability of the fetus, and placental location.

In addition to assisting with stabilization of the woman, the nurse will likely be providing emotional support for the injured woman and her family. If the trauma is the result of an MVA, other family members may also have been critically injured or killed. The nurse collaborates with staff members in other units of the same hospital, as well as at other hospitals, to make sure that questions are answered and consistent information is given. Grief support may also be necessary.
In the presence of severe, multisystem trauma, peri- 
mortem cesarean birth may be indicated. Removal of the fe-
tus early in the process of resuscitation may increase the 
chance for maternal survival. With maternal death, fetal sur-
vival is unlikely if cesarean birth is accomplished more than 
20 minutes after maternal demise. Therefore, to facilitate ma-
ternal resuscitation, a cesarean birth may be indicated after 
4 to 5 minutes of external resuscitative efforts are ineffec-
tive (Cunningham et al., 2005; Van Hook, Ges, & Pacheco, 
2004).

With minor trauma the woman may be discharged home 
after an adequate period of EFM that demonstrates fetal re-
assurance and absence of uterine contractions (Cunningham 
et al., 2005). Her vital signs should be stable, with no evi-
dence of bleeding at the time of discharge. There should be 
no uterine contractions, and the FHR tracing should be re-
assuring before monitoring is discontinued and the woman dis-
charged (Cunningham et al., 2005). Education for the 
woman and her family is important. She should be in-
structed to contact her health care provider immediately if 
changes in fetal movement or signs and symptoms indica-
tive of preterm labor, PROM, or placental abruption de-
velop. If the trauma occurred as a result of a MVA, the 
woman should be reminded about the importance of wear-
ing a seat belt and given directions for using it correctly dur-
ing pregnancy (position the lap belt over hips and thighs, 
rather than across the abdomen) (see Fig. 9-18). If the 
trauma occurred as a result of domestic violence, the woman 
may need information about intimate partner violence (see 
Chapter 4); referral to a crisis center, law enforcement 
agency, or counseling center; and help in forming a safety 
plan.

Contact your local hospital, obstetric offices, 
health department and mental health counselors 
to assess resources available for pregnant wo-
men and their families who have experienced a 
pregnancy loss. Assess the availability of written 
resources reviewing the level of literacy of the re-
sources and support groups. Review the hospit-
al policy and procedure for women experiencing 
a pregnancy loss to include written materials, 
parental memorabilia, and disposition of fetus.
Clotting disorders are associated with many obstetric complications. An enlarged uterus, displaced internal organs, and altered laboratory values may confound differential diagnosis in the pregnant woman when the need for immediate abdominal surgery occurs. Preoperative care for a pregnant woman differs from that for a nonpregnant woman in one significant aspect: the presence of at least one other person, the fetus. Most traumatic maternal injuries are a result of motor vehicle crashes, followed by falls and direct assault to the pregnant abdomen.

Preclampsia
1. Risk factors for preclampsia include: obesity, pre-existing diabetes, family history, nulliparity, women at extreme ends of the reproductive continuum and African-American ethnicity.
2. Assumptions:
   a. Possible diagnoses for Demetria include: gestational hypertension severe, preclampsia, HELLP syndrome.
   b. Physical assessment will include head to toe baseline physical assessment, V.S., particularly BP with patient on her left side, weight, FHR, fetal movement, deep tendon reflexes, edema (facial, hands, and tibial) and clonus. Nursing assessment will include questioning regarding headache, blurred vision, scotoma, nausea, vomiting, fetal movement, and epigastric discomfort or pain.
   c. Research supports the relationship of obesity to endothelial activation and a systemic inflammatory response. Genetic factors predispose Demetria to preeclampsia. Immunologic maladjustment similar to graft-host rejection is evidenced by microscopic changes at the maternal-placenta bed, as in first pregnancies.
3. Priorities for nursing care at this time include controlling Demetria’s blood pressure, facilitating uteroplacental perfusion, and monitoring for neuromuscular irritability and disease status. Hydralazine IV with BP check in 10 minutes and notify obstetric provider if the BP remains elevated. Therefore, nursing care will include: physical assessment every shift, V.S., particularly BP with patient on her left side every 4 hours, daily weights (at the same time of day), FHR every 4 hours, fetal movement every 4 hours, deep tendon reflexes every 4 hours, edema (facial, hands, and tibial) every 4 hours, and clonus every 4 hours. Nursing assessment will include questioning regarding headache, blurred vision, scotoma, nausea, vomiting, fetal movement, and epigastric discomfort or pain. In addition, intake and output (with a minimum urinary output of 30 ml/hour) will be monitored and all urine tested for urinary protein. A heplock is ordered for intravenous access and emergency medications.
4. Yes, there is initial evidence to support the diagnosis of preeclampsia.
5. Further information is necessary to differentiate between gestational hypertension, preclampsia, superimposed preclampsia, or chronic hypertension. Her initial prenatal records have been requested from the local health department where she is receiving obstetric care. In addition, results from ordered laboratory and maternal-fetal tests will provide more information for decision making.
COMPLICATIONS OF CHILDBEARING

Centers for Disease Control and Prevention (CDC)
1600 Clifton Rd., NE
Atlanta, GA 30333
404-329-8121
404-329-8226
www.cdc.gov

Division of Violence Prevention–CDC
Intimate Partner Violence
www.cdc.gov/violencepov

COPE (Coping with the Overall Pregnancy/Parenting Experience)
37 Clarendon St.
Boston, MA 02116
617-357-5588
Family Violence Prevention Fund
330 Rhode Island St., Suite 304
San Francisco, CA 94103
415-252-8900
www.fvptf.org

Left Sidelines Magazine–Bedrest
Sidelines
2803 Park Place
Laguna Beach, CA 92651
949-497-2265
www.sidelines.org

National Domestic Violence and Abuse Hotline
800-799-SAFE

References


